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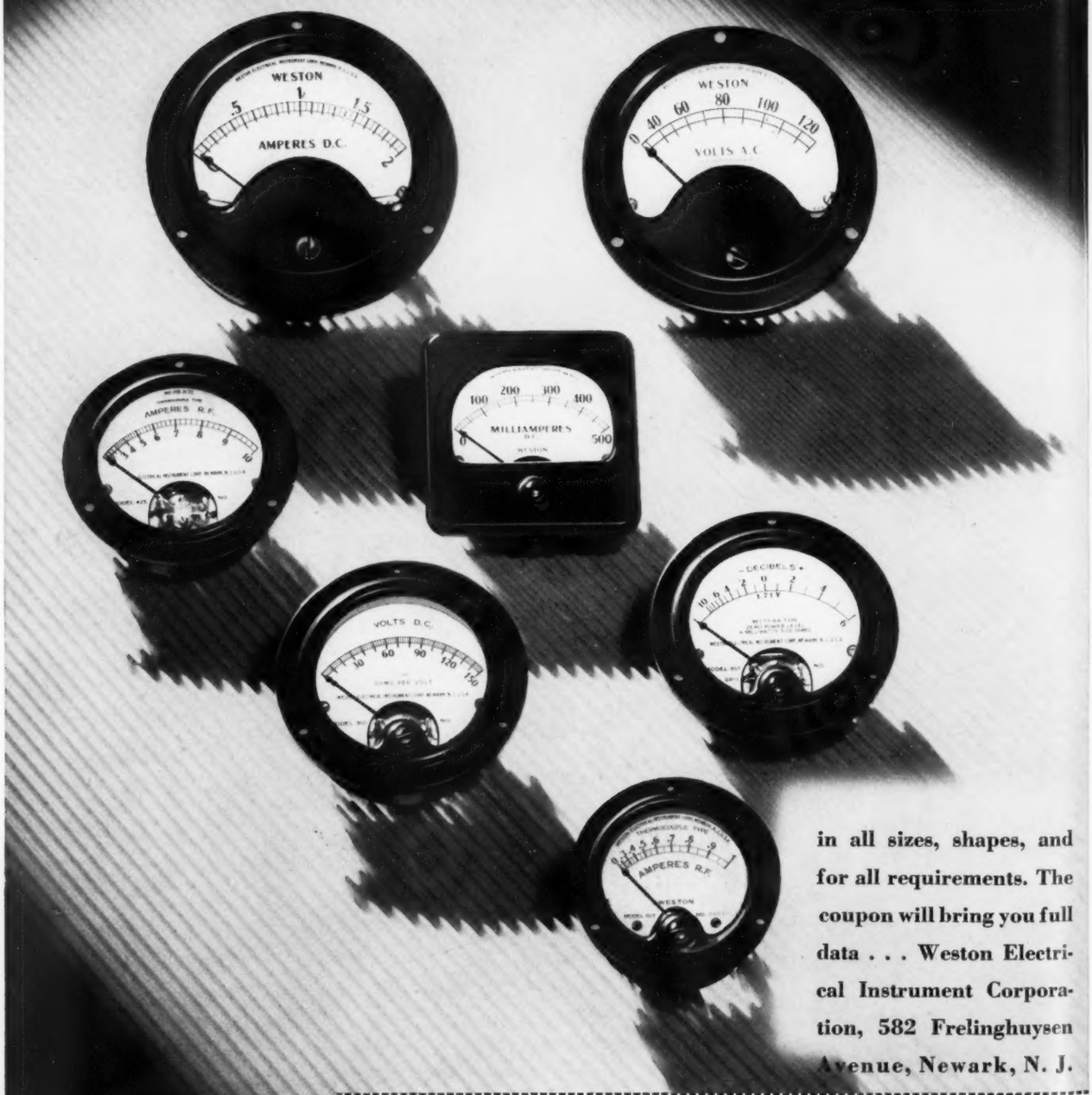

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Reader's Guide to This Issue

This index is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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LETTERS TO THE EDITOR

Oscillograph Locates Line Faults

To the Editor of ELECTRICAL WORLD:

The article entitled "Accurate Line Fault Location," on page 23 of the July 20 issue of ELECTRICAL WORLD, has been read with interest. Fortunately, only a small percentage of overhead line outages result from causes which are permanent, and therefore prevent immediate return of the line to service. When the damage is sufficient to keep the line out of service it is frequently important to be able to locate the point of failure promptly.

In the last few years there has been developed an entirely different method of locating transmission line failure. A number of companies which have been using automatic oscillographs to get records of system disturbances have found that these records provide a means of determining the location of a short circuit with considerable accuracy. This method is applicable regardless as to whether or not there is damage sufficient to prevent immediate return of the circuit to service. Obviously, promptness in locating the fault is less of a factor if the line can be returned to service immediately, but many companies patrol a line after each interruption, in order to check up the extent of damage, if any.

The ability to calculate the approximate location of the fault from automatic oscillograph records saves much time in patrolling the line; in some cases it has shown the patrol crew where to concentrate their efforts, and helped them eventually to locate a flashover which had escaped their notice during the patrol of the entire line. Thus, flashovers have been found by this means which would otherwise have been undetected, or would have been located only with extreme difficulty.

The automatic oscillograph records will not show the location of a broken conductor, as such. However, if the conductor break is caused or accompanied by a short circuit, as is usually the case, the oscillograph record will show its location.

I understand that one company has built a dark room at the station where there is an automatic oscillograph. The operator develops each record as soon as made and by comparing the oscillogram with a chart which has been previously prepared he can tell the patrol crew where to look for trouble within fifteen minutes after it occurs.

I am not in possession of exhaustive data as to the accuracy of this method under all circumstances. I have heard of one case where a flashover was located within $\frac{1}{2}$ mile on a 40-mile line ($1\frac{1}{4}$ per cent), and of another case where a flashover was located within two towers on an 80-mile line (less than 1 per cent). One company reports that investigations of more than 30 flashovers, some of which were on lines remote from the oscillograph, located about 50 per cent of them with an accuracy of 5 per cent or less of the length of the circuit on which they occurred.

In addition to its ability to indicate the approximate location of short circuits (regardless as to whether or not the damage is permanent) the automatic oscillograph provides much valuable information with regard to system operation, relay and circuit breaker timing, nature of faults, magnitudes of short-circuit currents, and system oscillations caused by disturbances, all of which are of incalculable value to relay and operating engineers in keeping their systems tuned up for the best possible service.

ROBERT TREAT,
Central Station Engineering Dept.,
General Electric Company,
Schenectady, N. Y.

•

Computing Schedules For Street Lighting

To the Editor of ELECTRICAL WORLD:

Some few years ago you had printed and made available schedules which outlined the time at which dusk and dawn occur in different parts of the United States and they were quite valuable in the use of operating street-lighting systems, in order that the lights might be turned off and on at the proper time. I am wondering if at this time you have such charts available and how we might procure some of them?

M. DOUGLAS PARKS,
Southwestern Light & Power Co.,
Chickasha, Okla.

[A method of computing an accurate street-lighting schedule for any given locality was described by P. R. Knapp of the Toledo Edison Company in the ELECTRICAL WORLD of September 24, 1932, page 404. The method involves only simple arithmetic and when once made the schedule serves for a number of years. It has the merit of taking into account both variation in the length of daylight as affected by the latitude of the place, which differs materially between the northern and southern parts of the country, and the location of the place in its time belt, which may cause a departure as great as half an hour in the time of sunrise and sunset compared with standard time.—EDITOR.]

On Panama Rates as a Yardstick

To the Editor of ELECTRICAL WORLD:

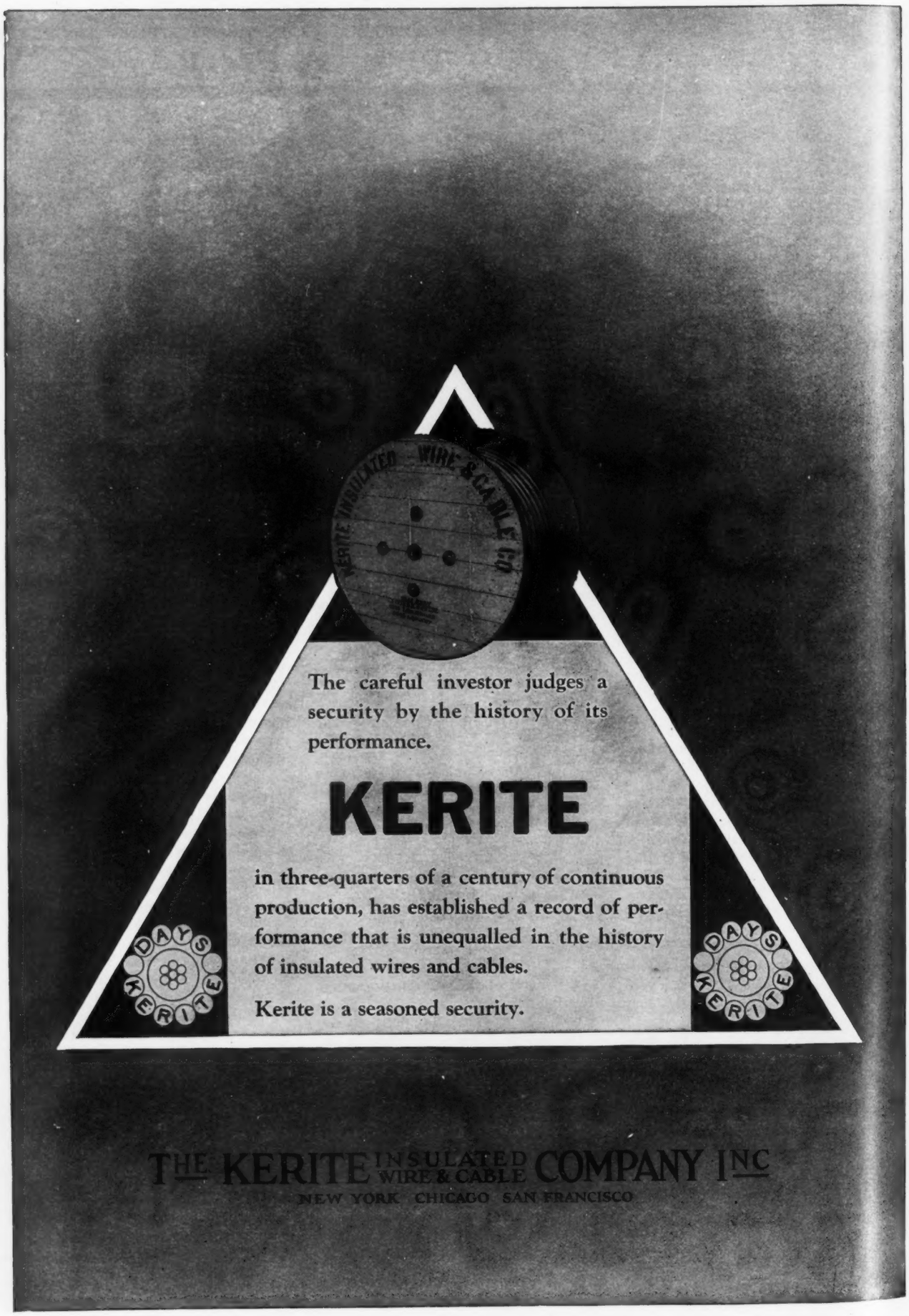
I have just finished reading the editorial, "Canal Zone as a Yardstick," on page 32 of the ELECTRICAL WORLD, August 17, 1935, and hasten to correct what may be an erroneous impression to those who read your excellent publication.

The rates of the Canal Zone cannot properly be used as a yardstick to measure rates in the United States, in my opinion, nor are they believed comparable to the rates of the T.V.A. Conditions here are so entirely different from such developments that a comparison may easily prove misleading. In the first place, our electricity is largely a by-product of the operation of the Panama Canal.

The two great dams from which we get our pondage, Gatun Dam and Madden Dam, were built for the canal and none of their costs were included in the power system investment. No taxes of any kind are paid, there is no rental for land included in our costs, and we aim to make only 3 per cent on the invested capital. On the other hand, our wages for skilled labor are considerably above those in the United States; our equipment costs, because of freight charges, are also higher, and finally, consumption is relatively small, while the duplication of installations for security purposes makes our capacity factor a minimum.

In your editorial you have selected a rate which is not our standard basic rate. That quoted by you is a special rate paid only by a few customers whose total consumption is less than 1 per cent of our output. It is not the rate charged the large number of employees of the United States Government and those entitled to employees' rates, who use about one-fifth of our output. It does not include the Army, the Navy, the Panama Railroad or the various departments and divisions of the Panama Canal, which together use about 80 per cent of our output. It might be termed an arbitrary rate influenced by considerations too involved for explanation in this letter. Under our other rates, which are very definitely based on the total cost of production, including a 3 per cent return on investment, the consumer who uses 50 kw.-hr. is charged \$1; the 200-kw.-hr. customer pays \$3.63, and he who is so extravagant as to use 400 kw.-hr. pays \$6.13.

M. P. BENNINGER,
Electrical Recorder,
Electrical Division, Panama Canal.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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

OCTOBER 26, 1935

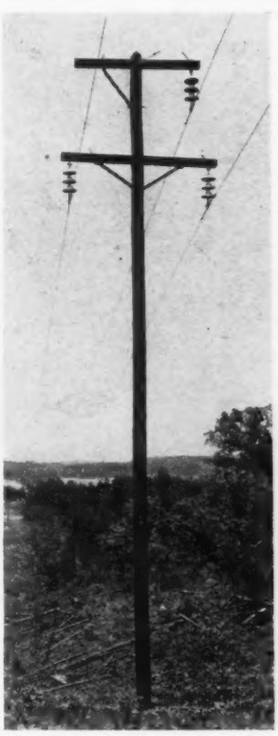
S.E.C. and Management

THE destiny of the utility industry lies in the hands of its management, the S.E.C. and the courts. As days go by the S.E.C. finds itself facing a gigantic and almost impossible task. Utility managements find it almost impossible to discover an exit from the legal labyrinth. The courts are cluttered with cases on hand and many more are contemplated. A $13,000,000,000 industry is facing a life-and-death battle at the worst and a long-drawn-out and troublesome reorganization at the best.

Within the next thirty days utility managements must decide whether to register with S.E.C. and therefore formally give this commission jurisdiction on some $4,500,000,000 of holding company securities outstanding, as well as management over the major part of the utilities in this country. The decision is difficult to make. The law is vague and its effects depend upon the interpretation of the Securities Exchange Commission. The law is questioned as to its constitutionality, yet months must elapse before a decision is had.

Weighing all factors, it is believed that utility managements will find it best to register and to try and work out the new legislation on a co-operative basis pending court decisions. This action is based upon a great amount of faith in the fair dealing of the Securities Exchange Commission with perhaps some reliance on quick action in the courts.

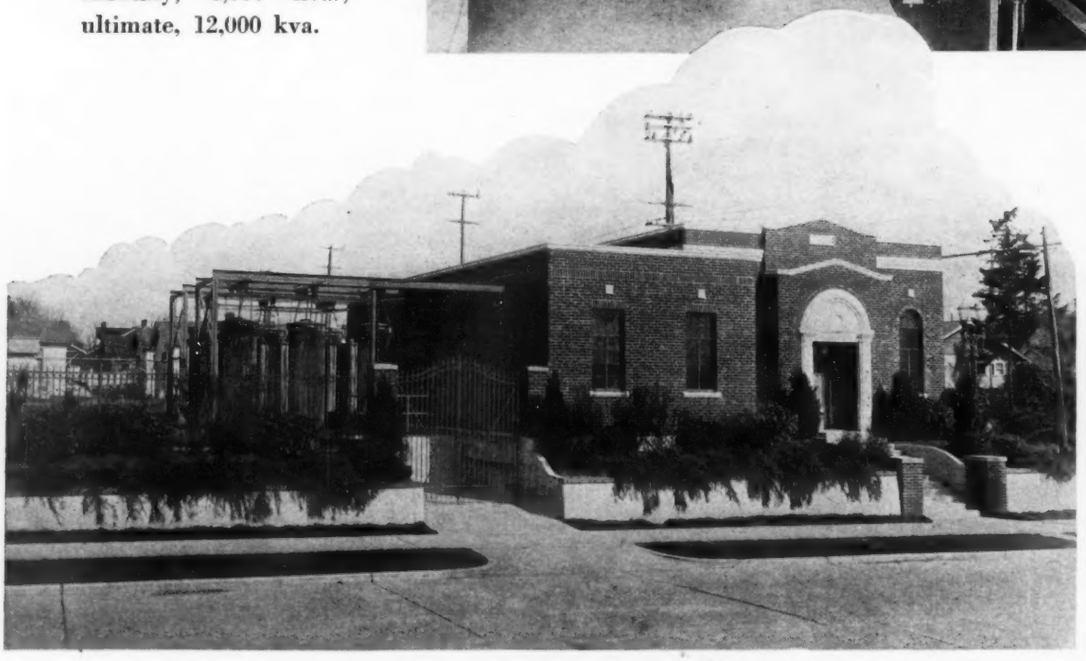
To date the S.E.C. has gone slowly and carefully. It has acknowledged the magnitude of its task and has sought aid and counsel. It acts as though it knew that it is impossible for its members to manage the utility industry intelligently and on an informed basis. The utility business is linked to all the chains that make for social well-being and industrial prosperity in this country. It is too big and too complex to be susceptible of management by any political executive group. Yet this is the literal interpretation of the law and this is the fallacious concept that motivates those who proposed the law.



A SANE approach to an almost impossible task is for S.E.C. and utility managements to sit around the counsel table in a step-by-step program that endeavors to carry out the provisions of the law until the courts can act. We have faith that experience will afford the evidence to show that many provisions of the law are unsound, unworkable and not in the public interest. We have faith that S.E.C. and utility managements will approach their common task intelligently and co-operatively. We believe a brief experience in endeavoring to carry out the law will give the evidence needed to bring about its change and modification.

Above all things, this legislation and its application should not be permitted to hamstring electrical developments in this country. Utility managements have a job to do on the properties as well as in Washington. The job on the properties is in the public interest and is fundamental to recovery. S.E.C. will do well to bear this in mind in the work it has undertaken and in the demands it makes on the time of utility managers and their supporting staffs.

Puget Sound's new California Avenue substation in West Seattle typifies what can be done to harmonize beauty with utility where severity would offend. Complete automatic operation, 13.8-kv. supply to 2,400/1,600-volt distribution. Initially, 4,000 kva.; ultimate, 12,000 kva.



UNOBTRUSIVE SUBSTATIONS FOR RESIDENCE AREAS

Station Battery Selection

Operating Factors Which Determine the Rating, Location, Charging and Maintenance of Control Battery

By WAYMAN A. HOLLAND
General Electric Company, Philadelphia

BEFORE the selection of control batteries can be taken under consideration the conditions of service must be established. In this article the discussions are based upon the condition that the method of operation will be to float the battery on a charging source of constant potential, with provision for obtaining a sufficiently higher voltage for higher rate charges after unusual load demands, or after a shutdown of charging source. This assures always a fully charged battery. It is also assumed that a lead cell battery is to be chosen.

The selection of the battery will then depend upon the following factors:

Voltage of control.
Permissible battery voltage at end of maximum demand.
Type of service.
Load demand.
Whether located in attended or non-attended station.
Ambient temperature.
Care and maintenance facilities.
Station space available.

The voltage of control will determine the number of cells in the battery. The most common control voltage is nominally 125 and this requires 60-cell batteries. In large stations or in installations that require high current and, or, long runs between the battery and the electrically operated devices it frequently proves economical to employ 250-volt control, or 120-cell batteries. In smaller installations, where the control current demand is not high and the runs are short, lower voltages are sometimes used, such as 48 volts (24 cells) or 24 volts (12 cells), for tripping, with consequent economy and easier maintenance.

Allowance for voltage drop

Permissible battery voltage at the end of the maximum demand is an essential factor, because upon this the rating of the battery depends. Complete rating involves time, amperage and voltage. For control batteries it is customary to specify that the battery voltage shall be not lower than 1.75 volts per cell at the end of one minute and a battery of ample rating to supply the given demanded control current under these conditions must be selected. Standard remote control apparatus is usually designed to operate over a comparatively wide range of voltage variation, and for breakers with 125-volt control this range for the closing service is from 90 to 130 volts (measured at the terminals of the apparatus to be operated), with full operating current flowing. The 1.75 volts per cell of a 60-cell battery gives a total battery voltage of 105, which amply allows for conductor drop between the battery and the operating mechanism, as well as some margin of safety. This also assures a sufficient reserve for satisfactory operation of the devices, even though the battery may have just been called upon for its maximum load demand. For other control voltages the operating ranges are proportional and, consequently, the battery rating of amperes to give 1.75 volts per cell is the standard specification for batteries for control service.

Type of service that the battery will be called upon to perform is an important item in the battery selection, whether the battery is to be used for tripping only, for tripping and closing, or for emergency load in addition to tripping and closing duty. This will be discussed later in connection with the load demand.

The load demand, after the preced-

ing items have been settled, is the most important factor to be considered. It is obvious that for control service it is absolutely necessary that the battery at all times be capable of supplying the energy required of it. Selection of the battery is then made in accordance with the following conditions:

(a) *Tripping Service Only*—If the battery is to be used for tripping service only and the total number of devices does not exceed twenty, it is usually a safe assumption that never more than half the total number will trip simultaneously. Where the total number of devices exceeds twenty the number to trip simultaneously probably will never exceed one-third the total number (except that between 21 and 29 devices, ten may trip simultaneously).

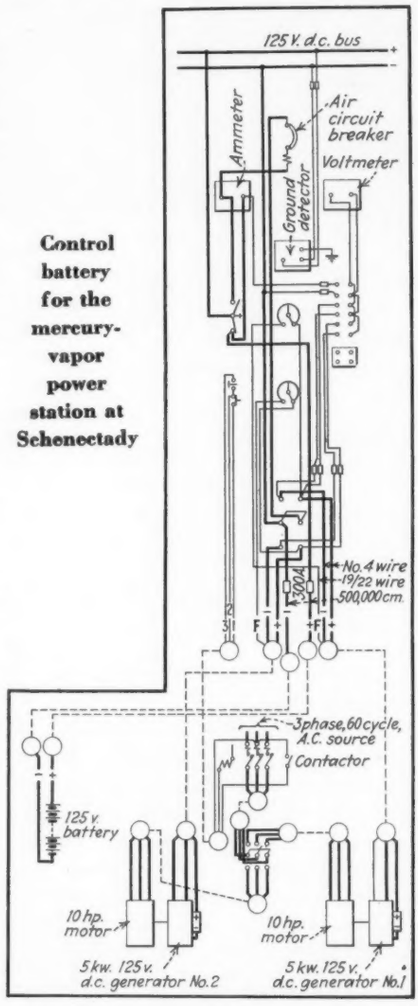
(b) *Closing and Tripping Service.*—If the service is for closing and tripping it is the usual condition that not more than one breaker will ever be closed at a time and the closing current usually governs the battery rating; however, if the number of breakers assumed to trip simultaneously in accordance with the preceding paragraph requires more current than the closing, this will be the deciding factor. If the conditions are such as to require the simultaneous closing of more than one breaker this fact must influence the battery rating. This condition exists where circuit breakers in the high and the low sides of power transformers are operated simultaneously or where two breakers may be used in connection with auto-transformers for motor starting, and in other special cases. This condition may also exist in an automatic station, especially where there are feeders equipped with immediate reclosing features. Careful consideration must be taken of the likelihood of simultaneous operation of two or more such feeders, and this point must be made a factor in the study of the load demand.

(c) *Duration of Breaker Operations*—Mention has already been made of the importance of the length of time the load drain continues, in the determination of the battery rating. The duration of any single circuit breaker operation does not usually exceed one or two seconds, and batteries subjected to intermittent high rate discharges recuperate rapidly during intervals of rest, so that a battery having a one minute rating, down to 1.75 volts, in amperes equal to the maximum demand will easily provide for any reasonable number of successive operations.

(d) *Other Than Breaker Loading*—In addition to circuit breaker closing and tripping operation the power station undoubtedly will have other apparatus to be controlled from the same battery, such as electrically operated generator field rheostats and field switches, governor motors, electrically operated steam valves or water gates, electrically operated disconnecting switches and similar apparatus. These all are not usually operated simultaneously with the breakers, but it is obvious that in the battery selection these ratings must be taken into account and proper provision made where any simultaneous operation may occur.

(e) *Allowance for Emergency Lighting*—If in addition to the control service an emergency lighting load demand exists, it is usually assumed that this demand will be required for a maximum of three hours and the required battery capacity for this load for that period of time is added to the one-minute demand for the true control service.

Still another part of the load of a control source is composed of the indicating lamps and the holding coils of relays, contactors and similar equipment. Under ordinary operating conditions such load is carried by the trickle-charging source and is neglected in computing the battery rating. If, however, there is a large number of lamps and coils, so that this load becomes appreciable, enough battery capacity (in addition to other load demands) must be provided to carry this load as long as the trickle-charging source may for any reason be shut down.



Control battery for the mercury-vapor power station at Schenectady

Separate room provided for battery, with cells arranged in tiers. Method of operation is to float battery. Two 4-kw. motor-generator sets, one a standby, are provided for trickle charging. Power for these sets is taken from station auxiliary bus. Control voltage is 125. No abnormal temperature requirements. A large number of oil circuit breakers plus motor-operated disconnecting switches, electrically operated valves, etc., make the requirements for the battery more severe than for a smaller station.

The battery was selected to satisfy the requirements of the following specifications:

Two oil circuit breakers to be closed simultaneously (each requiring an instantaneous inrush of 160 amp.).

Fourteen amperes continuous load for a period of eight hours (for indicating lamps and holding coils of relays, contactors, etc.).

Sixty amperes, emergency lighting load, for one hour.

Applying these requirements separately to the manufacturer's battery ratings, computing the battery plate requirements necessary for each, and adding them demanded a 27-plate battery having an eight-hour rating of 520 amp.-hours, which was supplied.

In manually operated stations it is customary to assume the maximum period of such operation will be twelve hours and for non-attended stations 24 hours. No hard and fast rule can be made, however, because so much has to depend upon the conditions of the particular case in point. Where the non-attended station is under supervision, or where the emergency drain on the battery is heavy, this time may be only eight or even three hours. On the other hand, in remote stations where such close supervision is not practicable even longer periods may have to be considered for emergency battery service without trickle-charge power present.

Typical example of demand estimate

In order to illustrate the method of computing the battery rating according to the foregoing rules, let it be assumed that a station has nine oil circuit breakers to be closed and tripped, two generator field rheostats, field switches, governor control motors and steam valves. There are eleven indicating lamps, but no contactor coils nor other continuous load. The control source is to be a 125-volt battery. Two of the breakers take 55 amp. and seven 40 amp. to close. All require 6 amp. each to trip, the other devices require much less current, and accordingly if a battery having a one-minute rating down to 1.75 volts per cell of 55 amp. is chosen it will have adequate capacity. Assume, however, that an emergency load of 5 amp. for a period of three hours will be required and assume further that there is likelihood of a trickle-charge control source shutdown for twelve hours.

Now the battery must have sufficient additional capacity to satisfy these conditions. By reference to manufacturers' rating tables it will be found that battery ratings are given for one-minute, three-hour and twelve-hour service, from which the ampere rating per positive plate may be computed, of each type of battery. Thus, the 55 amp. for one minute may require 1.5 positive plates of a given size, the 5 amp. for three hours would require 1.1 positive plates, while

the eleven lamps would require 0.4 amp. for twelve hours, or 0.12 positive plate. Thus, the entire load demand would require a total of three positive plates of the same size and style as a battery having only two such plates if only the circuit breaker control were considered.

In attended stations, where operators can observe any irregularity or abnormality in the operating conditions and take immediate steps toward correction, it is usually quite satisfactory to select the less expensive "pasted" plate type of battery, but when the battery is to be installed in a station where the fluctuations in the trickle-charge voltage and other irregularities cannot readily be regulated or corrected, it may prove more economical in the long run to adopt the sturdier and longer lived Planté type of battery.

Temperature factor significant

Since the functioning of the battery depends upon chemical reactions, it is obvious that the temperature of the electrolyte is an important factor. Manufacturers' published ratings are usually at 77 deg. F. At higher temperature somewhat greater ratings could be obtained, but these are ordinarily of negligible value as the rating at normal temperature is the governing rate.

At lower temperatures the ratings have to be reduced. In manually operated stations there is little likelihood of very low temperatures, but in unattended locations where variations in cell temperatures are much greater proper allowances must be made. It is not general practice to provide emergency lighting in unattended locations, consequently temperature corrections are ordinarily necessary for only the one-minute and the 24-hour rates. One manufacturer recommends a decrease in amperes at the one-minute rate of 0.9 per cent per degree F., that the temperature is below 77 deg., and at the 24-hour rate, 0.6 per cent per degree F., below 77 deg.

Storage batteries concededly provide the most dependable service for assuring an uninterrupted supply of current for the operation of remote-controlled and automatic power station protective, regulating and switching equipment, such as oil circuit breakers, field rheostats, valves, etc., as well as for emergency lighting. This article discusses the factors that must be considered in the selection of the battery for the control source of a power station. Batteries have reached a new importance in the power industry as sources of control. Specifications for their design and performance have changed greatly. It will pay to get up to date on modern batteries.

Maintenance lengthens life

A storage battery that has proper care and is maintained in first-class condition will last many years and will outlive one that operates under less favorable conditions. Where the station is lacking in proper maintenance facilities, or adequate supervision, the Planté type of battery, while more expensive in first cost, will very likely prove to be more reliable and less expensive over a period of years.

After all of the other factors have been considered in the choice of the battery the final selection will depend upon the space available for its installation and the cells will have to be arranged in rows or tiers to suit. In former days when open-cell type batteries were used under operating conditions of cycles of charge and discharge, it was essential to have a separate battery room, but the modern use of sealed-in batteries and low charging rates to keep the batteries always charged have so reduced the gases liberated and acid spray that the isolation in a separate room is no longer necessary, although for a neat and well-ordered station a separate room is still desirable.

Codes Will Not Work

I will admit that many of us gained, financially, during the time of code operation. I will even admit that my own company went from the red to slightly in the black during that period. But I'm damned if I know whether it was due to the code or to the natural slight increase in business due to the first stirrings of economic recovery. I do know, however, that some of our so-called pre-code chiselers waxed fat, and increased their normal percentage of the total business, by chiseling under the umbrella that the code-obeying members of my section of the industry were forced to hold over them. I also know that a new technique of chiseling was developed by many, and that some unsound practices were established that it will probably take us years to eradicate. For the sake of argument, I am willing to admit that codes and the NRA were good things as emergency measures. But I don't think we want them as part of our permanent economic structure. I am convinced that they will not work.

I doubt the ability of any group of men to write a workable code for even the most simple of industries, and for one as vast and complex as the electrical manufacturing industry, I feel sure that it cannot be done.

FRANK C. JONES,
President N.E.M.A.

Strengthening Distribution

Reducing Opportunity for Failures That Delay Service Restoration — Increasing Life of Parts That Deteriorate Rapidly — Improved Relaying and Lower-Cost Substations

Distribution accounts for a large part of utility investment. It is now undergoing changes because of new loads and new developments in the art. This article suggests ways and means to meet distribution economic and operating problems. It should interest manufacturers as well as utility and industrial engineers. Continuity of service and protection of lines are capable of improvement.

By W. L. GARLINGTON

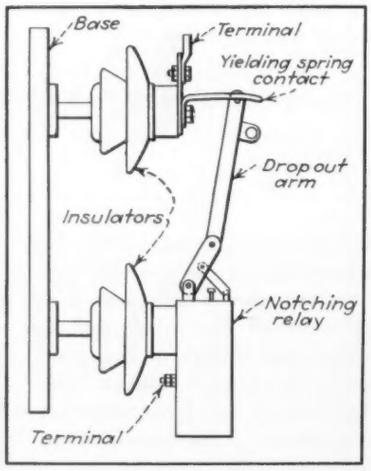
Florida Power Corporation, St. Petersburg.

DISTRIBUTION costs are so varied and widely scattered that concentrated effort on any one cost seldom has much effect on the total. On the Florida Power Corporation system, where many conditions are adverse to good operation, many minor improvements have recently been made to lower maintenance and capital charges and give better continuity of service.

One group of improvements involves reducing the number of flashovers which disable the distribution system so service restoration is impossible until the damage is repaired. The ability of various pin-type insulators to withstand shattering upon flashover has been determined by test and the types most immune adopted for future use. Co-ordinating gaps in addition to lightning arresters are being used in some cases to protect station equipment. The duration of heavy power arcs responsible for conductor burn-downs and other equipment damage is being reduced by installing instantaneous attachments on the feeder inverse-time relays to give better co-ordination between the feeder relays and fuses protecting individual transformers or feeder branches. Possibility of further reducing time-lever settings on some feeder relays is being planned through the use of a new type notching sectionalizer on feeder branches in place of fuses.

Attention has also been paid to the elimination of unnecessary investment cost. One 11-kv. distribution system with common primary and secondary neutral has been in service four years with a single case of trouble due to the interconnection. The cost of two-pole type substation structures has been reduced by the improved design shown.

Increasing the life of parts of the

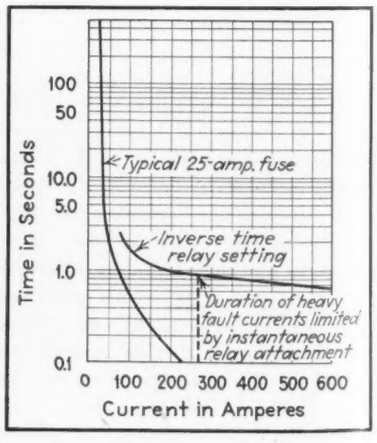


Automatic sectionalizer with notching relay

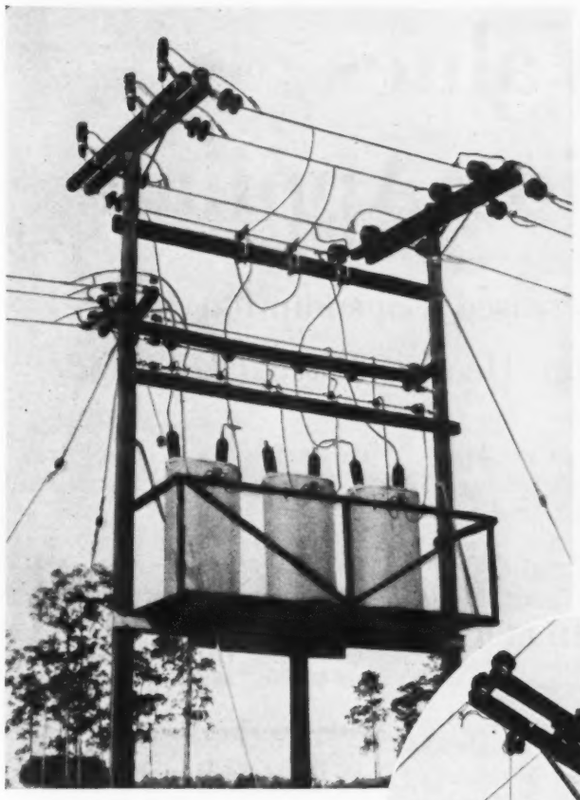
Further reduction of time-lever settings on feeder breakers is planned by the use of this notching sectionalizer in feeder branches in place of fuses. The notching relay operates instantaneously, but requires several successive fault-current impulses to trip. These are provided by the feeder breaker reclosing on the fault. Restoration of normal load conditions before the sectionalizer trips immediately resets the relay for a new sequence of fault operations.

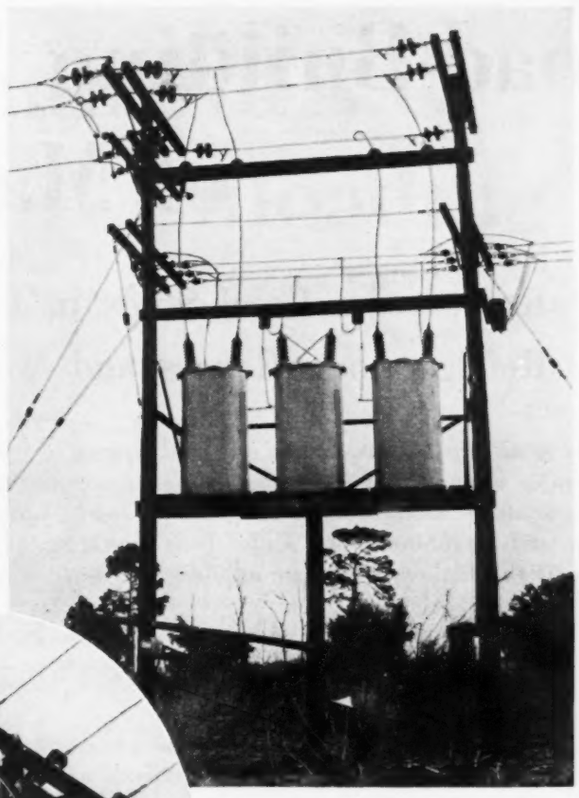
Creosoted pole victim of improper treatment before or during creosoting

Action of rot and termites starts at the ground line. Unless checked or prevented by proper treatment they cut pole life seriously and increase replacements.



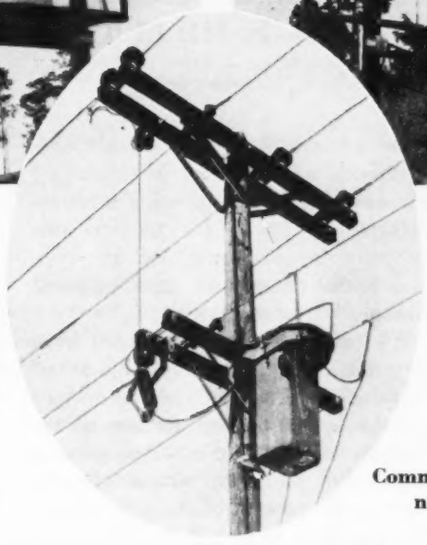
Instantaneous relays paralleled with inverse-time relays co-ordinate better with fuses





Improvement in platform-type substation

(1) Fuses have been moved to a less hazardous location at one end of the structure and the platform walk beside the transformers eliminated. (2) Lighting arresters are now installed on the load side of the fuses rather than the line side to protect the feeder against arrester failure. (3) Point-to-point co-ordinating gaps back up the arrester protection. (4) Where required one set of metering equipment is used for metering all secondary circuits leaving the station. (5) Secondary bus has been changed from vertical to horizontal arrangement to increase clearances, improve appearance and make the station more universally adaptable for all conditions and combinations of equipment.



Common primary and secondary neutral on this installation

distribution system subject to the highest rate of depreciation has also been found effective. Rot and termites in the heart of poles have focussed attention on proper creosoting and a more rigid inspection before acceptance. The life of two-pole type substations has been increased by the use of a steel transformer platform in place of wood. Since several ground buses and rods have been corroded in two, leaving principally a chloride which points suspicously to the salt used to lower the resistance as the active agent, chemical soil treatment to lower the resistance is being abandoned wherever possible. Driving the rods to a greater depth usually gives a satisfactory resistance. Relocated distribution transformers are being given a longer service life without failure through testing and reconditioning before placing back in service.

In an attempt to obtain reclosing service on a fused feeder branch, the main feeder relays were co-ordinated with the branch fuses so that the main feeder breaker would trip before the branch fuses opened. The breaker was equipped with fast reclosing relays and if a fault persists on the branch upon reclosure, the accumulated heating effect of the fault currents opens the fuses before the breaker trips again. Fairly reliable operation is obtained, but trouble is experienced from charring of the interior of the fuse tubes. We are passing this along as a hint to manufacturers.

Grand Coulee — Chicago — New York

A striking comparison of the magnitude of the Grand Coulee high dam project is found in the comparison of its contemplated capacity and output with those existing in New York and Chicago in 1934. But note the differences in the territory and the population, assuming the entire state of Washington and its population is served from Grand Coulee.

	Generating Capacity, Kilowatts	30-Min. Peak Demand Kilowatts	Estimated Output Kilowatt-Hours	Population	Area Served Sq. Mile
Greater N. Y.	2,200,000	1,250,000	5,250,000,000	7,000,000	310
Chicago	1,300,000	950,000	4,250,000,000	3,500,000	200
Grand Coulee	1,890,000	1,300,000	8,000,000,000	1,599,000	66,836

Load-Building Values of Major Appliances

Record of a Local Study of Increased Consumption Where Refrigerators, Ranges and Water Heaters Have Been Sold

Is it safe to use commonly accepted figures of energy use by major appliances for calculating added revenue to determine how much money should be spent for load building? Maybe so and maybe not. Mr. Miller feels that it is better for each utility to find out what each appliance is worth on its own lines.

By B. E. MILLER
Wisconsin Power & Light Company, Madison

DOMESTIC use of electricity increased 837,379,000 kw.-hr. in 1934 over 1933. Household electric refrigerator sales for the United States increased from 1,065,105 units for 1933 to 1,372,526 units in 1934. It is reasonable to assume, then, that 1,218,816 (one-half of the 1933 sales plus one-half of the 1934 energy) refrigerator units were instrumental in contributing to the increased kilowatt-hour sales of 1934 over 1933. Assuming an annual average use of 575 kw.-hr. per refrigerator, the added refrigerators (1,218,816) account for 700,819,000 kw.-hr. of the added 1934 domestic energy sales, or for 83.69 per cent of the added sales. If we should be bold enough to assume an average annual use of 600 kw.-hr. per refrigerator, we account for 87.33 per cent of the total domestic increased sales through the addition of refrigerators to the distribution lines.

If these figures for refrigerators are trustworthy, then the normal increases in kilowatt-hours of all equipment already in use, of added lighting and small appliances, added ranges, water heaters, ironers and of all other devices, together with the entire use of all new customers and old customers reconnected, account for only about 12 to 17 per cent of the increased domestic sales of 1934 over 1933. The added 1934 refrigerator use on the above basis accounts for about 6.1 per cent of the total 1934 domestic increase of 7 per cent, leaving only 0.9 of 1 per cent to be accounted for by the uses of all other existing and added equipment previously enumerated.

Some doubt exists in our minds as to the advisability of using the above-mentioned average uses in estimating increased kilowatt-hour sales from refrigerators. In so far as our own company is concerned, we are convinced that many of the "national averages" are too high.

We feel that in the past we have been too willing to accept so-called "national averages" and laboratory tests in estimating annual uses of appliances and to ignore to too great a degree the part the human element plays in the control of their operation. We are also led to believe that we may have paid too much attention to the matter of adding units of equipment to our lines as compared with the effort put forth to sell the service to the purchaser. Substitute means of performing in part the service for which the appliance was installed, and relative costs of operation, whether real or imaginary, have much to do in restricting estimated kilowatt-hour sales and corresponding revenue. So we set out to find in the particular case of the Wisconsin Power & Light Company just what, in terms of energy use and annual consumption, each one of the three major appliances was worth on the system. The results—in energy use only, since revenue is a matter of local rates for local determination—appear in the accompanying tabulations.

It is to be emphasized that the figures given here are not set forth in contradiction of accepted "national averages" nor to be taken without discrimination by other utilities for their own use. The point of these figures is that it would probably be wise for each utility to base its load-building expenditures on the actual performance of appliances on its own lines rather than too trustfully to accept and to use "national averages."

Electric Range Analysis

Individual Customer Data

Month	(Used Part of Year) Before Range Purchase Kw.-Hr.	(Used Part of Year) After Purchase Kw.-Hr.	(Used All Year) Before Range Purchase Kw.-Hr.	(Used All Year) After Purchase Kw.-Hr.
January	31	66	33	151
February	32	75	38	178
March	14	75	37	197
April	14	92	31	172
May	13	129	23	125
June	14	125	20	156
July	12	169	20	133
August	12	128	18	193
September	14	160	23	108
October	17	137	29	148
November	19	155	25	170
December	20	86	33	142
Totals	212	1,377	330	1,873

Range Analysis Summary

No. of Customers	Customer Months	Before the Installation Kw.-Hr.	After the Installation Kw.-Hr.
193	2,269	105,195	328,704
Per customer month		46.4	144.9
Increase from range		....	98.5

The analysis covers 193 representative range customers who had been on the lines for one year or more. The individual customer data were recorded for a year prior to the range installation and a year subsequent to the installation. These data are for two typical customers—one of them an all-year-round user, while the other apparently used other means of cooking to supplement the range during part of the year. Data at hand indicate that many customers disconnect

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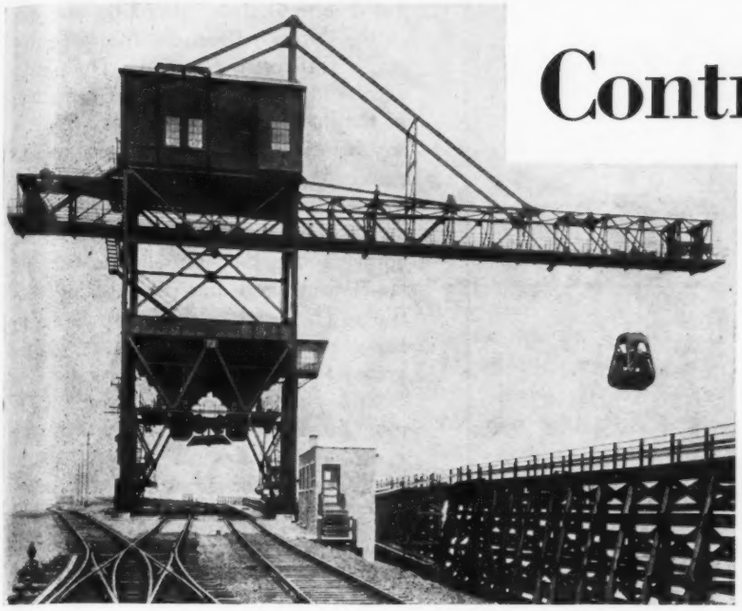


Control of A.C. Unloading Tower

By H. L. LINDSTROM
Dravo Contracting Company, Pittsburgh

Has Several Operating Advantages Over Previous Hoists Due to Mechanical and Control Features Cited — Unit Consumption, Demand and Power Factor

THE new coal-unloading tower used by the Pittsburgh & Lake Erie Railroad at Colona, Pa., for transferring coal from barges to railroad cars includes features of control which have several advantages over previous a.c. hoists. This transfer plant, which is a straight-line tower with rope trolley, has been unloading barges at the rate of 500 tons per hour with a 7-ton bucket, which means a complete cycle in about 40 seconds. Including barge-shifters, hopper-gate operation and all other power used in the tower, the energy consumption has been 0.312 kw.-hr. per ton of coal unloaded, the maximum fifteen-minute demand 176 kw. and the average power factor 0.60.

Among the results achieved by the unusual mechanical and electrical features are the following:

1. Eliminates friction clutches and brakes.
2. Eliminates mechanical, manually operated brakes.
3. Assures closed bucket during hoisting.
4. Automatically equalizes rope tensions.
5. Saves operator's time.
6. Decreases maintenance of brakes and ropes.

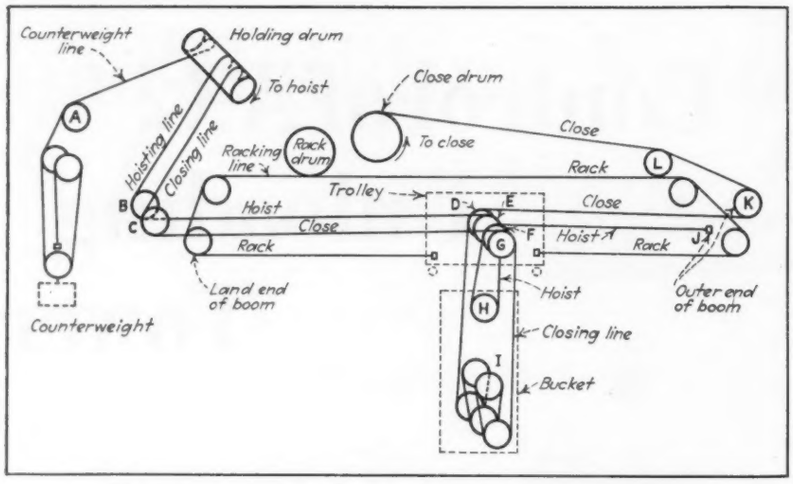
These new features are not restricted to straight-line, rope-trolley hoists, but are applicable to man trolleys, bridges, locomotive-type cranes or to any grab operation using hoisting and closing lines.

Controls of the bucket and barge-shifting operations, in particular, are new. The former was designed to overcome the mechanical clutches, brakes and unbalanced rope tensions of the single-motor hoist and the disadvantageous speed characteristics of a.c. wound-rotor motors in previous two-motor hoists. Barge-shifter control was arranged so as to simplify the work of the operator and dock crew in shifting barges. The difficulty of trying to obtain equal rope tensions on the hold and close lines of a single-motor hoist and the consequent excessive rope wear and relining of brakes and clutches are too well known to be repeated here. The a.c. two-motor scheme has been attempted, but it is inherently unable to attain or maintain equal rope tensions without using perfectly matched motors, not making allowance for manufacturing variations.

While this particular unloading or transfer structure may not be adapted to every industrial and utility requirement, the new mechanical features and associated control are not restricted to straight-line, rope-trolley hoists, but are applicable to man trolleys, bridges, locomotive-type cranes and any grab operations using hoisting and closing lines. The use of a.c. hoisting equipment is not an essential element of this installation. The constructor's original preference regarding types of motors, control and brake equipment was considerably modified by the policy of the railroad for which it was built.

To eliminate the objections without resorting to a.c.-d.c. conversion equipment, a new mechanical arrangement of the bucket holding and closing systems (Fig. 2) has been devised which required the new control system devised for it.

Requirements of Closing Motor— For the closing motion a high pull-out torque, wound-rotor induction motor is used, just large enough to open and close the bucket, but with a pull-out torque equal to the maxi-



Unusual rope reeving for the bucket and trolley lines

Bucket is opened by revolving closing drum in opening direction a fixed number of turns. When this is done the closing drum stops. Bucket is then lowered to coal pile on hoisting line alone, since closing line will be slightly slack. Counterweight is raised simultaneously. When bucket is on coal pile, with some slack in hoisting line, it may be closed by revolving closing drum the same number of turns. When it starts it will first reeve "close" line through bucket until all slack way back to hoisting drum is removed and will then nearly close bucket. Next move is to hoist. Since closing line is taut, rotation of hoisting drum will first reeve closing line back through bucket, completely closing bucket, when slack is removed from hoisting line. Both lines are now taut and bucket may be raised. Closing-drum brake set to slip if more than half load is on closing line, so if drum over-runs the hoisting drum cannot raise full bucket on closing line alone. Brake will slip until rope tensions are equalized. A 7-ton, gravity-opened, coal-digging clamshell bucket is used and the total lift from barge to hopper is 85 ft.

mum resisting torque of the bucket which rises sharply on approaching the closed position. A hydraulic thruster-type brake produces a smooth stop. However, this characteristic (the gradual application of braking torque) very nearly defeated its purpose by being too slow and too erratic. As long as a thrustor brake is energized and released, the impeller is turning at full speed, tending to pump oil from the bottom of the piston to the top and forcing the shoes away from the wheel through levers. When power is cut off from the thrustor motor, the impeller continues to rotate for an appreciable time before coming to rest, and the thrustor piston does not move appreciably to apply the brake until the impeller stops. Then the brake spring may force the oil back through the ports in the piston and apply the brake.

Under the majority of hoist applications this works very nicely. Power is cut off from the motor and brake simultaneously. During the interval between power cut-off and the gripping of the brake the friction or weight of the load will start deceleration. Then gradual application of torque will finish off a very smooth stopping action.

Controls Avoid Troubles—Since the rope pull to close the bucket rises sharply as it approaches complete closure, the rope tension at the instant of power cut-off is 75 per cent higher than the average during closing. During the interval when there is neither power torque nor braking torque, the closing drum not only came to rest but the rope tension accelerated it in the opposite direction and started to open the bucket again. The condition was remedied by a contactor and relay which, at the instant of cut-off, applies plugging torque to the thrustor-impeller motor just long enough to stop the impeller. The "dead" time interval is thus reduced so the brake is now able to catch the closing drum before it reverses.

This correction also eliminated a tendency toward variable stopping positions. As shown by Fig. 2, the success of the scheme depends on the accuracy of bringing the closing drum to rest at the same point every time. This *must* be done regardless of the bucket load and the amount of slack in the hoisting line. With a long drift period and comparatively light braking torque, variations in load produce a magnified effect on stopping time; shortening of the drift period practically eliminated the erratic stops.

A time-limit acceleration, reversing and plugging controller with a three-point master switch is used for closing. Six steps of acceleration are provided in the "close" direction and one in the "open" direction, the latter being a full-resistance step. No power acceleration is required for opening, as the bucket opens itself very quickly by merely releasing the brake, but provision is made to bring in the primary contactor only, to break loose any stiff grease or ice. Limit-switch contacts stop the opening motion and slow down and stop the closing motion. The final "close" stop is set to bring the lips of the bucket just together when both lines are taut.

Two points have been given particular attention in the design of the resistor. The first step is sufficiently high so that the slack may be taken out of the rope without any slapping or jerking. Then the master switch may be moved directly to the second and third points without the necessity of "jogging" the first point. One step gives maximum stalled torque, so that opening of the slow-down limit switch inserts the proper resistance to obtain maximum torque at creeping speeds.

A switch is provided to by-pass the final "close" limit switch on such infrequent occasions as the following: During cleaning up the bucket is partly closed, stopped, and then the closing completed. Sometimes the motor does not get up to speed before the limit switch trips it out, thus stopping the motion too early. Use of the by-pass switch permits the operator to continue the closure with maximum torque.

Hoist Motor and Control—For hoisting, a crane-type, wound-rotor induction motor is used, which is large enough to maintain the duty cycle of both the "hoisting" and "closing" lines, relieved considerably by the counterweight. The brake is identical to that on the hoist except that the torque setting is higher. The same scheme of plugging the thrustor motor is applied so the operator can work with safety closer to the boom and barge and the counterweight may be raised and held more readily when slack line is needed.

Hoist motion is controlled by a time-limit acceleration, hoisting, lowering, plugging controller governed by a four-point master switch. "Hoist" and "lower" limit switches are used. At times it may be desirable to store the bucket in the hopper. When it must be put into service again it is usually found that the hoist time-limit

[*Continued on page 78*]

Record of a Co-operative Farm Line

This article shows fifteen years experience with a rural co-operative line. It indicates what will happen with R.E.A. funds unless supervision, accounting and management are given to rural co-operatives. Farmers cannot build and operate an electrical system. This interesting history gives a factual background to rural electrification that is needed badly. It should interest manufacturers of equipment, merchandisers, utility men and government officials.

THE main things needed are some educational efforts, a liberal sales proposition and some one to make a vigorous and sustained sales drive." These words conclude the "Report on the Kegley Branch Rural Electric Line," made by the Public Service Division of the Iowa State Planning Board. The Kegley branch line is owned and operated by the farmers who take service from it. The line was built in 1920 by 27 subscribers, extended in 1921 to serve five more and during this time its affairs have been administered by the same men as officers. Energy is supplied from Story City, Iowa, a municipal system.

The study brings out very clearly the characteristic deficiency of mutual service undertakings of this kind, which is the entire absence of commercial enterprise, as is inferred from the quotation that begins this article.

Also disclosed by the study is the equally characteristic fact of service at less than cost by failure to recognize and include in cost such items as depreciation and interest.

Upkeep of the line has been neglected so that "even an ordinary windstorm may completely wreck large stretches of the line in its present weakened condition . . . so wrecked would be almost a total loss except for the transformers . . . ." Due to lack of maintenance and to lack of technical knowledge, the efficiency of line operation has always been low, ranging from 29.9 to 53.3 per cent and averaging only 44.9. Unnecessarily large transformers and practically continuous tree grounds account for most of the lost energy.

This is not to intimate careless management. On the contrary, "the care and firmness of the management is shown by the facts that the company has always paid all bills promptly, has no debt and in 14.83 years of operation has lost in unpaid energy accounts or assessments not

[*Continued on page 84*]

Record and Analysis of Operations of Kegley Branch Co-operative Rural Electric Service Line, Story City, Iowa

No. Item	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	Average
1 Net investment (note)	$9,898	$12,377	$12,456	$12,446	$12,446	$12,446	$12,449	$12,454	$12,456	$12,463	$12,459	$12,478	$12,520	$12,520	$12,595	$12,499
2 Depreciation (5% of 1 of year before) (note)	412	598	619	623	622	622	622	622	623	623	623	623	624	626	626	614
3 Net accum. dep. reserve (note)	412	1,011	1,629	2,243	2,870	3,487	4,099	4,701	5,309	5,856	6,319	6,926	7,507	8,133	8,599	4,659
4 Worth at beginning of year (note)	9,898	11,552	11,367	10,827	10,204	9,581	8,959	8,350	7,752	7,147	6,607	6,140	5,552	5,013	4,387	8,917
5 Working capital (10% of 14)	98	162	159	134	136	146	139	158	163	161	156	159	147	120	140	147
6 Rate base value (4+5) (note)	10,189	11,894	11,525	1,961	10,340	9,729	9,098	8,508	7,915	7,308	6,763	6,298	5,700	5,133	4,527	8 489
7 Interest (7% of 6)	594	833	807	767	724	681	637	596	554	512	473	441	399	359	317	586
8 Fixed costs (2+7)	1,007	1,431	1,426	1,390	1,346	1,303	1,259	1,218	1,177	1,134	1,097	1,064	1,023	985	943	1,200
9 Taxes (note)	16	5	8	5	94	90	67	66	62	1	1	1	1	28	44	33
10 Insurance (note)	....	125	144	25	25	25	40	40	40	40	45	45	45	45	85	52
11 Miscellaneous expense (note)	139	125	139	119	144	109	123	109	166	106	104	107	115	111	84	121
12 Upkeep (note)	114	236	158	65	80	186	60	101	86	271	129	158	122	134	253	145
13 Cost of energy	707	1,129	1,139	1,131	1,020	1,049	1,098	1,263	1,267	1,195	1,281	1,275	1,192	879	937	1.117
14 Operating costs (9+10+11+12+13)	976	1,619	1,588	1,344	1,363	1,459	1,388	1,579	1,622	1,613	1,560	1,586	1,474	1,197	1,403	1 468
15 Total costs (3+14)	1,983	3,050	3,013	2,734	2,709	2,763	2,647	2,797	2,799	2,748	2,657	2,650	2,497	2,182	2,346	2,669
16 Cost per consumer (note)	73.36	95.31	94.17	85.45	87.39	89.12	82.72	87.39	93.30	91.58	88.56	88.34	83.25	68.20	73.30	85.41
17 Total income (note)	825	1,934	1,544	1,455	1,340	1,357	1,459	1,659	1,670	1,600	1,696	1,734	1,465	1,209	1,384	1,506
18 Income per consumer (note)	30.54	60.43	48.25	45.48	43.21	43.78	45.58	51.84	55.67	53.12	56.54	57.79	48.82	37.79	43.25	48.48
19 Energy purchased—kw.-hr.	14,138	22,570	22,780	22,620	20,782	20,984	22,385	25,824	28,254	29,539	31,984	31,881	31,220	25,160	26,580	25,401
20 Energy sold—kw.-hr.	4,231	8,253	8,114	8,200	7,692	8,160	9,398	12,204	13,895	14,492	16,748	16,997	14,475	12,245	13,885	11,395
21 Distribution efficiency % (note)	29.9	36.6	35.6	36.3	37.0	38.9	42.0	47.3	49.2	49.1	52.4	53.3	46.4	48.7	52.2	44.9
22 Cost per kw.-hr. sold—cents (15÷20)	46.7	36.9	37.1	33.3	35.2	33.8	28.2	22.9	20.1	19.0	15.9	15.6	17.3	17.8	16.9	23.4
23 Income per kw.-hr. sold—cents (17÷20)	19.5	23.4	19.0	17.7	17.4	16.6	15.5	13.6	12.0	11.0	10.1	10.2	10.1	9.9	9.8	13.2
24 Loss per kw.-hr. sold—cents (22−23)	27.3	13.5	18.1	15.6	17.8	17.2	12.7	9.3	9.1	8.0	5.8	5.4	7.2	7.9	7.1	10.2

1. Book cost at beginning of year, including overhead and labor, plus additions and minus retirements during preceding year.

2. Some items in the 1920 and 1921 columns, like this one, are weighted to compensate for only ten months operation in 1920 and for addition of five subscribers in 1921. Items so weighted will apparently be out of line with explanations in these notes.

3. Accumulated depreciation minus retirements.

4. Difference between net investment (1) of previous year and net accumulated reserve (3) also of previous year.

6. For 1920 and 1921 this item includes $193.23 and $180.63 respectively as "merchandise on hand," material left over from construction and later sold.

9. Prior to 1924, practically no property taxes were paid. In that year a notice of back taxes due was presented. The delinquent taxes, about $400, were remitted and property levies were paid through 1928, but since have remained unpaid. The tax items in 1933 and 1934 are sales taxes mostly.

10. Up to 1928 only employee compensation insurance was carried; in that year liability protection was added. Adequate insurance coverage, comparable to that required of private utilities, would cost four or five times what is shown here.

11. Includes legal, traveling, notarial, office supply and other expenses as well as secretary's compensation and directors' fees.

12. Includes line, transformer, meter and all other maintenance.

16. In 1920 this item is the quotient of item (15) divided by 27; in 1921, '22 and '23 by 32; in 1924 and '25, by 31; in 1926 and '27, by 32; in 1928 to '32 inclusive, by 33; and in 1933 and '34, by 32. These divisors are used to obtain income consumer figures also.

17. Income includes payments for energy used, transformer charges, connection charges to new consumers, assessments on stockholders, sales of surplus and salvaged materials and miscellaneous. The respective averages per year of the foregoing items are $732.38, $442.20, $15.05, $297.40, $13.03 and $5.64.

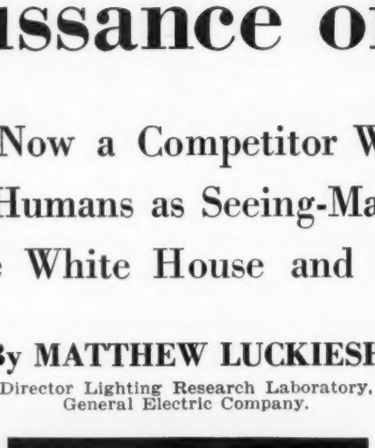
18. See note (16).

21. Included in lost energy, difference between items (19) and (20), is unmetered electricity furnished free to three schools. This might amount to 100 kw.-hr. per year per school.

The Renaissance of Lighting

Artificial Lighting Now a Competitor With Daylight—Applied as a Tool to Humans as Seeing-Machines—New Principles Invading the White House and Other Installations

By MATTHEW LUCKIESH
Director Lighting Research Laboratory, General Electric Company.



LIGHTING now is presented with its first opportunity to fulfill the purpose for which it has been made, sold, bought and used. The narrower science of vision—of eyes and the visual sense—was not, and could not be, an adequate foundation for lighting development and practice. It reveals only the conditions for barely seeing. Any one knows when he can see or cannot see to perform a given visual task. The science of vision reveals only threshold conditions—the minimum amount of light, for example—necessary for barely seeing. It does not reveal the penalties to human beings for performing visual tasks under such conditions. However, when seeing was conceived as an activity of the entire human being a new conception of lighting requirements was born. Human beings became human seeing-machines. A new research attack was launched which aimed to reveal the optimum conditions—adequate light and proper lighting, for example—under which human beings could see with adequate ease, speed, comfort, accuracy and certainty. Although a science of seeing is not complete by any means, sufficient knowledge is available to begin a great revolution in lighting. At least there has been born the kind of knowledge necessary for specifying light and lighting.

Specifying light

There are three links in the chain of lighting connecting light sources and human beings and their general welfare. Two links, *production* and *control* of light, have long been available. They involve physical science, and with only these links available lighting was considered and practiced as engineering in its narrow sense. Lighting, as everything else, suffers from traditions, particularly when they are empirical or not founded upon sufficient or the right kind of knowledge. In the new deal in lighting great difficulty is encountered in leaving the old behind and in grasping the new concepts and knowledge. The third link in the chain—*specification* of light and lighting—is the most important one, because it connects the lighting with human beings. The forging of this link must be done largely by a science of seeing. It reveals the proper and intended goal of lighting—providing the greatest help to human seeing-machines. That goal is a partnership of seeing and human welfare. Adequate light and proper lighting conserve human resources. The true specifications of light and lighting are based upon determinations of their effects upon human beings. The science of seeing is built of such knowledge.

When based upon new knowledge of human welfare, modern lighting everywhere that critical seeing is done becomes a social service. Even a utility company evolves into an institution of social service. Everywhere throughout the work-world, in homes, on streets and highways, lighting is provided a new and powerful approach by the science of seeing. Through this new knowledge the lighting business gains powerful allies, such as eyesight specialists and welfare organizations. And a lighting consciousness has been awakened for the first time in the history of the lighting business.

The human seeing-machine is interested only in three things—the visual task, the eyes or visual sense, and light or lighting. Some tasks can be altered or designed to make seeing easier. Eyes can be corrected by glasses with the same result. But light is always necessary and it is always controllable. In the answer to the question, How can I improve seeing conditions? lighting is always involved. This analysis and the new knowledge are largely responsible for the awakening of lighting consciousness. Of the three factors light is the most controllable and under present conditions is most susceptible to improvement.

Selling lighting

The science of seeing provides a new and powerful approach to every field of lighting, to every specific case of lighting and to every activity of human beings which involves critical seeing. This is stated as a fact of intimate experience, but to any one in doubt it is presented as a challenge. However, a vast amount of knowledge has already been assembled into a science of seeing and it must be possessed before it can be effectively used.* Engineers must consult something more than the traditional catalogues, empirical rules and engineering. They must study the facts of another realm—a psychophysiological science—which connects lighting and

*"Seeing and Human Welfare," by M. Luckiesh, Williams & Wilkins Company, Baltimore, 1934. "Seeing—A Partnership of Lighting and Vision," by M. Luckiesh and Frank K. Moss, Williams & Wilkins Company, Baltimore, 1931.

human beings. This is the source of specifications of light and lighting. Similarly, commercial departments and salesmen must do likewise. Certainly lighting is bought for seeing, and it can scarcely be sold with much force or confidence without knowing about seeing—about what lighting does for the user. Seeing and human welfare is the new and true basis. Upon such a basis lighting can become a proud profession and a new service. Light sources, lighting equipment and installations acquire a proper basis for appraisal and design. Utilities are inspired to get into the business of being in business. The greatest opportunity is available for developing rates which make it possible to electrify America.

Artificial light was invented as a competitor of darkness. The science of seeing is making it a competitor of daylight. It has given lighting a job to do which is a hundred times bigger than the job it has been doing. Almost everywhere in the daytime and everywhere at night artificial light has this new big job to do. Through eyes backed by the new concepts and knowledge everywhere artificial lighting appears pitifully poor. Through such eyes little advance is seen in foot-candle levels since the advent of electric lighting. From the viewpoint of better lighting for seeing the artisan of the Dark Ages had practically as much light as is found throughout the world today where critical seeing is done. In fact, lighting has the opportunity for emerging from the Dark Ages and to make its rightful place along with other electrical devices in the service of modern civilization.

Artificial lighting has extended horizontally as civilization grew and also into new uses. But from the viewpoint of desirable foot-candle intensities revealed by the science of seeing it has scarcely grown vertically. Great progress can be made in this direction—in the quantitative use of light—without any expansion of civilization. Actually the lighting business can be increased many times in this direction by merely altering the viewpoint from barely seeing to seeing easily. Where the new story of the science of seeing is told such a change in viewpoint is quickly achieved. Even two years ago few dared to think of 25 or 50 foot-candles. Now several hundred thousand persons are already intimately enjoying such intensities in at least one spot in their homes—near a new study lamp or similar portable. And this is only the beginning even for them.

Already more than a thousand home-lighting representatives are carrying the new approach to homes. When they carry adequate knowledge with them they are universally successful. But the utility company not only has to learn what to see but how to sell. It must shelve the old campaign thinking and begin a new and protracted offensive. This new deal of lighting for seeing and human welfare is a great revolution. Thinking must evolve into a long-range sustained offensive. It is true that campaigns win offensives, but they must be planned, connected, supported as an endless series, and directed toward definite objectives involved in human welfare. This is another traditional rut from which the lighting business must escape.

Invading the White House

No place is so high or so exalted as to escape the penalties of lack of knowledge or of a slumbering consciousness. Nor can it resist the appeal of sound scientific knowledge. In September, 1933, the new story of seeing was presented to Dr. Ross T. McIntire, the White House physician. With his interest and encouragement, a survey of the lighting was made throughout the President's quarters. One or two foot-candles were available for reading in bed; little more was found in his private study and in his executive office. Everywhere the lighting was that based upon the old viewpoint of barely seeing. A lighting consciousness was just as completely absent as in the average living quarters of the humblest families or throughout the work-world. The new story of conservation of human resources through easier seeing by better lighting altered the entire viewpoint. A solution was always possible by means of new portable lamps.

In a short time the President and some of his associates were enjoying twenty to fifty times as much light as they had had available previously. And as new knowledge of seeing has adequately proved, not only was eyesight conserved but the waste of resources through unnatural and abnormal strain on nerves and muscles was lessened. We now know that certain external muscles which converge the eyes upon the task are three times as tired after reading large print for an hour under one foot-candle as they are after an hour's reading under 100 foot-candles. Our previous work on nervous and muscular tension proved that this is greatly reduced under high intensities of illumination. This is apparently correlated with our more recent work on the heart rate, which shows a great difference after reading an hour under one and 100 foot-candles, respectively. In fact, this opens the way for startling speculations on the relation of universally poor lighting upon health and even upon life. Any adequate presentation of the new facts and concepts revealed by the science of seeing is irresistible, but the story cannot be told by one who has not made this new knowledge his own. The new approach is essentially one of education, but first one must educate himself.

With a lighting consciousness aroused in the White House it was nat-

A great awakening is taking place in lighting development and practice. History should record the present as the Renaissance in lighting. Various potent factors are involved, but the underlying force is the science of seeing with its radically new concepts and knowledge. Selling may be achieved by arousing emotions, but scientific knowledge alone is convincing. Such knowledge pertaining to lighting for seeing has been generally absent from the commercial and technical aspects of lighting development in the past. About a decade ago research in seeing began to replace research which dealt with light and vision as tools. With this new conception of a scientific foundation for lighting which deals with seeing, the true objectives for lighting began to be revealed clearly for the first time. An entirely new vista of researches was opened. The results of these are constructing a much-needed science of seeing.

ural that the new executive offices should receive unusual attention in the matter of lighting. Notwithstanding the prejudices of tradition which lighting encounters in the design of buildings, the new executive offices stand out as lighthouses in a dim world as yet not illuminated by the applications of the new science of seeing. Extra capacity was provided in the air conditioning to take care of good lighting. Wiring is adequate to obtain nearly 50 foot-candles of general lighting. In private offices new portable lamps are specified on the desk to carry out the sound principle of general lighting plus localized lighting. In the President's office 25 foot-candles is readily obtainable from the cove which borders the elliptical ceiling. A portable lamp on the desk supplies a comparable intensity. And it is hoped that unusual brackets between the windows behind the desk will eventually provide still more light. Thus, it is possible for the President to have 100 foot-candles of artificial lighting, which is about one-third of the intensity of illumination at the window and one-tenth that outside, in the shade.

Even the Naval Academy

The influence of this new lighting consciousness continued to spread. In June, 1934, the statistics pertaining to the graduating class at the Naval Academy were startling to authorities newly acquainted with the new knowledge of lighting, seeing and human welfare. One out of eight in this class was rejected on account of defective eyesight, notwithstanding rigid examinations upon entrance to the academy. Naturally attention was turned to the lighting. It was found to be representative of the era of little or no lighting consciousness and seeing knowledge. Of course, visual tasks of civilization are unnatural and abnormally severe and prolonged. New-era lighting can scarcely be expected to eliminate eye defectiveness, but it can render tasks easier upon eyes, nerves, muscles, body and mind. At least it should reduce the progress and magnitude of eye defects. This is the inevitable conclusion at the Naval Academy. Likewise, it is a safe and reasonable conclusion throughout the work-world, schools and homes of the country. An entire rehabilitation of the lighting is now being planned at the academy. No other approach would have created the interest in and desire for better lighting.

The death-mill on streets and highways grinds relentlessly. The science of seeing can slow it down, for safety is largely a matter of seeing. But the little attention given to lighting in relation to accident prevention is based upon the old ideas—upon vision and visibility. However, seeing is a far different matter than these. In appraising the situation under which an accident occurred, the relative effectiveness of traffic aids, or the seriousness of menaces to traffic, an observer doing nothing else will often reach conclusions which are unjust and untenable from the viewpoint of human seeing-machines who are driving automobiles. The seeing problems on streets and highways illustrate all the major factors which distinguish seeing from vision. Seeing is a human act done by a human being who uses eyesight and light in performing this act. When the entire human being is ignored the ability of eyes as a tool is fixed. So is the visibility of an object. However, the conception of the human seeing-machine introduces vagaries and limitations of human beings, and these introduce factors of safety, certainty of seeing and other matters not involved in old consideration of vision and visibility.

Recently the new concepts and knowledge of seeing invaded the courtroom and won the type of case which invariably is lost by the defendant. In this case the driver of an automobile was sued for a large sum for killing a pedestrian on a clear night almost under a street lamp. The usual consideration of lighting and visibility were introduced in evidence. The reaction-times were calculated. One "expert" stated that it would have been impossible for the driver to see the pedestrian at a distance of 10 ft. ahead of the car. The plaintiff's attorney ridiculed the statement. He said: "Does any one think that if we sat in an automobile tonight on the spot where the accident occurred we could not see a person crossing at a distance of more than 10 ft. ahead of the car?"

Of course he was correct, but that situation had nothing to do with the case. The driver was not sitting there expecting a pedestrian. Under such a condition he was capable of seeing anything his eyes could see. However, he was driving an automobile and doing other things which reduced his efficiency and efficacy as a human seeing-machine. Everything he was doing —operating the automobile, listening to or for noises, looking here, there, everywhere, expecting anything anywhere at any time. Time—split-seconds —is involved in all cases. All these factors not only reduce the ability to see but they introduce the matter of certainty of seeing. They are not involved in the ordinary appraisal of visibility of an object or pedestrian by persons engaged in doing nothing else.

A careful presentation of seeing won the case for the defendant. A new basis for consideration of highway accidents and safety was established. That verdict laid the foundation for a new alliance between lighting interests and liability companies. Furthermore, a new approach to the problems of lighting streets and highways, of automobile headlamps and of rights of pedestrians and drivers is provided by the science of seeing. On this new basis lighting on streets and highways is revealed as pitifully inadequate and improper. Few installations are little more than good examples of glare.

A universally new approach

The foregoing are a few highlights and sidelights of the kind of thinking and knowledge which have recently come into lighting via the science of seeing. It is difficult to span the gap from vision to the new concepts necessary to understand seeing as a *human* activity in which human seeing-machines use light and vision as tools. But when this gap is spanned and the major principles and facts of the science of seeing are mastered, any one engaged in lighting practice sees endless vistas ahead, countless opportunities to give lighting its proper weight and place, and many new responsibilities in connection with human welfare. Then it becomes clear why a great revolution in lighting is under way. Then he too will join in that the science of seeing can revolutionize every field of lighting and provide a forceful approach to every lighting problem involving seeing. But this means education of the lighting business as well as the users of light. The new science of seeing is steadily being constructed, but there is adequate published material for study. New concepts and knowledge form the basis of all the new approaches, but they must be made the spearhead of commercial planning, lighting practice and education of the user of light.

New Record for Utilities

Revenue and Output Both Higher Than in Any Previous August; 5.1 and 10.5 per Cent, Respectively, Over 1934

UTILITY operations in August for the first time passed pre-depression levels for a comparable month as to revenue and continued the lead previously established as to energy output. The former rose 3.2 per cent over July to $156,038,300, according to the Edison Electric Institute, and slightly exceeded the August record of $155,053,100 attained in 1931. The rise over July was unusual and the increase of 5.1 per cent over the month last year was the largest, with one minor exception, for any month in more than five years.

The high energy output of 8,088,400,000 kw.-hr., 10.5 per cent greater than a year ago, was foreshadowed by the weekly reports of E.E.I. It not only set a new summer record, but closely approached the highest monthly figure ever recorded, in the winter of 1929-1930. Here, also, the rise of 3.1 per cent over July was exceptional. Almost the whole of the increase over August of 1934 was generated from water power; stream flow was more abundant this year and the output from that source was 32.5 per cent greater.

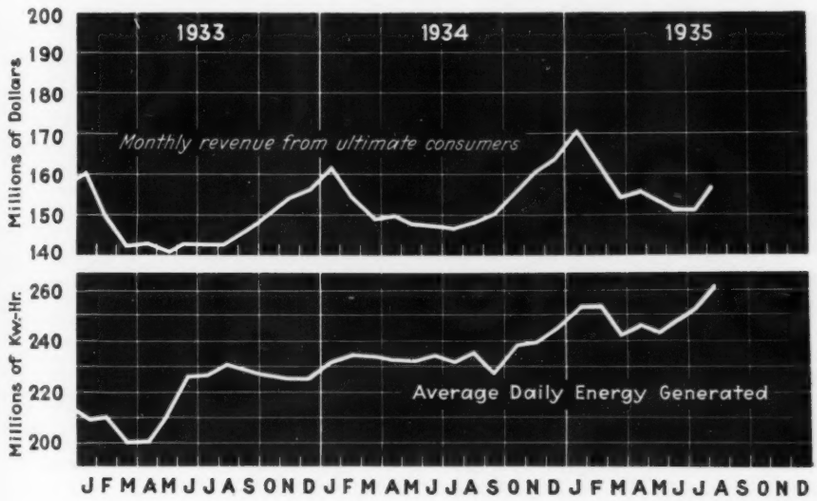

1933
1934
1935
Millions of Dollars
Monthly revenue from ultimate consumers
Millions of Kw-Hr.
Average Daily Energy Generated
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1935	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
August	156,038	+5.1	8,088	+10.5	3,107	+32.5	4,981	+0.1
July	151,215	+3.2	7,845	+ 9.3	3,325	+37.1	4,520	—4.8
June	151,436	+2.8	7,416	+ 5.6	3,242	+26.9	4,174	—7.2
May	153,203	+3.6	7,556	+ 5.1	3,511	+17.3	4,045	—3.8

Table II—Regional Revenue and Energy Output in August, 1935

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	156,038	+ 5.1	8,088	+10.5	3,107	+ 32.5	4,981	+ 0.1
New England	12,973	+ 4.6	545	+11.1	194	+ 39.5	351	— 0.2
Middle Atlantic	43,723	+ 4.5	1,933	+10.1	535	+ 35.3	1,398	+ 2.5
East No. Central	35,622	+ 6.1	1,896	+12.2	189	+108.0	1,707	+ 6.9
West No. Central	13,349	+ 2.7	543	+11.0	150	+187.0	393	—10.0
South Atlantic / East So. Central	19,349	+ 4.4	934 / 292	+18.2 / — 9.1	480 / 234	+ 17.3 / — 11.7	454 / 58	+19.1 / + 4.3
West So. Central	9,309	+ 4.4	445	+ 4.7	11	+ 96.0	434	+ 3.6
Mountain	4,939	+12.1	321	+45.0	264	+161.0	57	— 0.8
Pacific	16,774	+ 6.2	1,179	+ 8.2	1,050	+ 28.3	129	—52.5

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary.

Industrial sales mount

Among the various consumer groups the rise in sales to wholesale commercial customers was conspicuous. This item is now nearly 12 per cent greater than it was a year ago. As recently as last June it was only 3.7 per cent larger. There was an increase of nearly 8 per cent over July, unparalleled for this season since 1929, and with the exception of that one year all August sales of wholesale energy were passed.

Increase in domestic energy sales matched the increase in wholesale commercial with a rate over last year of 12.1 per cent, and over August, 1929, of 68 per cent, the latter showing the effect of the appliance load, notably refrigeration. In retail commercial sales the 9 per cent gain over last year was also larger than in any other recent month.

The number of customers, 25,220,374, is the largest on record. The increase over August, 1934, was about 579,000, nearly all in the domestic group, which now numbers 20,888,431. The average domestic rate, still dropping, is down to 5.15 cents per kilowatt-hour.

Table III—Allocation of Energy August, 1935

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	8,078	+10.5
Lost in transmission, etc.	1,464	+10.3
Sold to ultimate consumers	6,614	+10.6
Domestic	1,073	+12.1
Com'l, small light and power	1,177	+ 9.0
Com'l, large light and power	3,735	+11.9
Municipal street lighting	180	+ 8.2
Railways—street, interurban	333	— 0.4
Railroads—electrified steam	67	+24.2
Municipal and miscellaneous	49	— 8.1

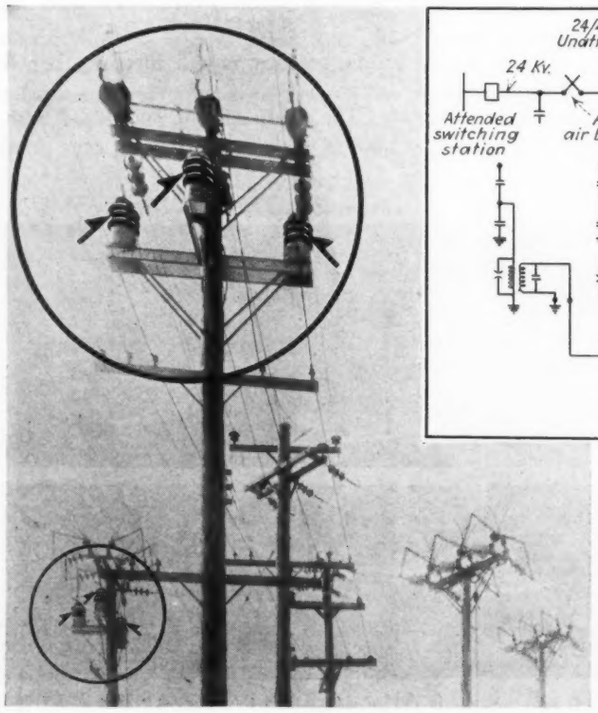
*Generated, purchased from other sources, imported, less energy used in railway and other departments.

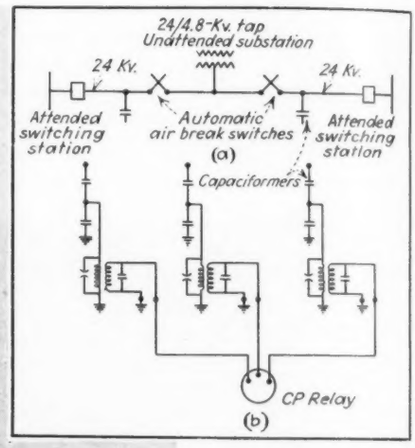
Controls for Rural Switching

Simple, Inexpensive, Compact, Pole-Mounted, Automatic Protective Equipment Has Given Satisfactory Service Since Its Installation

By H. W. COLLINS * and P. O. LANGGUTH †

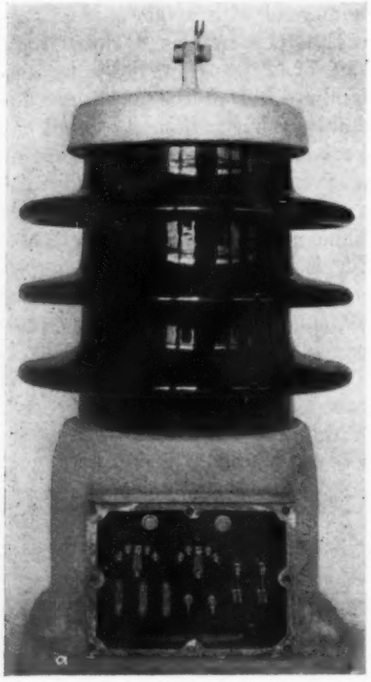
Rural service must be reliable. Cheap construction does not pay because of the large cost of maintenance. This article contains some ideas as to how to give reliable rural service by the use of special switching equipment. It should be valuable to all of those who are interested in rural electrification.



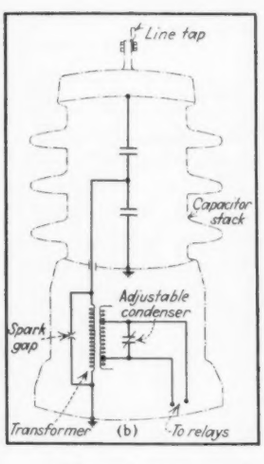


Type CP three-phase voltage relay operates contactors in circuit of motor operating air-break switch. Three capaciformers star-connected to 24-kv. line furnish voltage to the relay, thereby replacing conventional oil-insulated potential transformers.

Figs. 1 and 2—Pole-top switch controlled by capaciformer-energized relays isolates faulty sections and restores service



Contains compound-imbedded sectionalized condensers in series and low-voltage transforming network using potentiometer principle to obtain relay potential. The spark gap, really an evacuated tube, avoids high voltages in the control circuit. Extremely high surge voltages will flash over the outside of the capacitor porcelain because its puncture strength is greater than its flashover value. The dry value is 175 kv. at 60 cycles and the wet is 110 kv. The relatively high impedance of the upper portion of the capacitor stack prevents excessive voltages across spark gap and limits its current to a small value.



Adjustment of the relay voltage, effected by transformer secondary taps as well as the shunting condenser, is possible from the panel in the base. This condenser is primarily to prevent voltage pyramiding when the burden is removed. No separate control for phase angle is provided, but this relation is effected by the transformer ratio, network condenser capacity and burden. The capaciformer is adapted to supply potential to instruments and relays when the phase-angle displacement is of no importance.

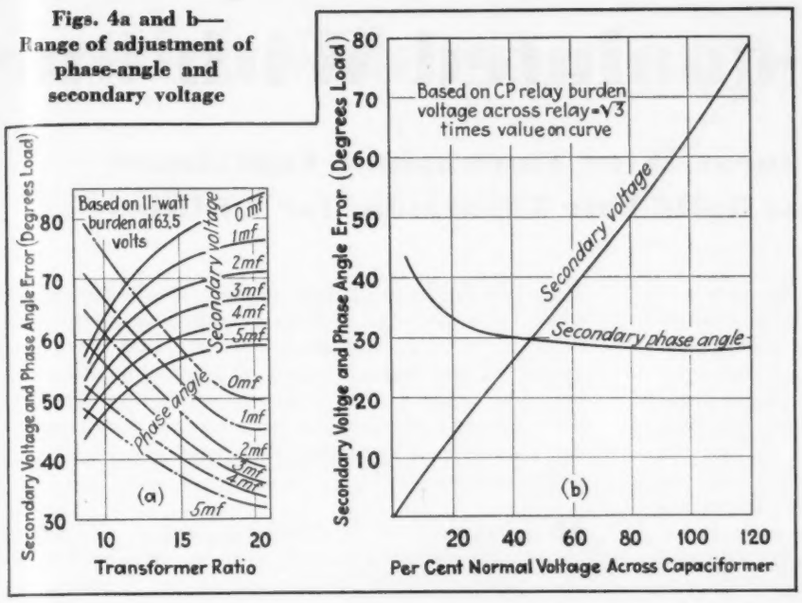
Figs. 3a and b—Capaciformer is self-contained unit

ADEQUATE protection of rural transmission lines is usually limited by the relatively expensive equipment involved. The conventional substation is not economically justified. Protective equipment must be automatically controlled and sufficiently compact for pole mounting.

The Detroit Edison Company has pioneered a switching scheme or application of the Westinghouse Electric & Manufacturing Company's "capaciformers," whereby a remote station fed by a tap from a line between two switching stations can be automatically isolated from the faulty section and receive power through the unfaulted section. The protective equipment, including an automatic motor-driven

*Assistant superintendent electric systems, Detroit Edison Company.
†Circuit breaker engineering, Westinghouse Electric & Manufacturing Company.

Figs. 4a and b—Range of adjustment of phase-angle and secondary voltage



Considerable range of phase-angle displacement can be obtained by proper selection of the network condenser capacity. The best over-all performance, however, is usually obtained by using the highest possible condenser capacity consistent with the required secondary voltage. The voltage performance of the capaciformer as adjusted for the CP relay burden is sufficiently accurate for voltage-relay operation. The phase-angle displacement is practically constant down to 20 per cent of normal line voltage. Curves apply to type PF capaciformer—24,000 volts, 60 cycles.

air-break switch, "capaciformers" and control cabinet, is mounted on the pole carrying the high-voltage circuits feeding the substation. The air-break switch will open on loss of voltage and reclose on its restoration.

As used at Utica substation, three capaciformers are installed on each of two 24-kv. lines. The individual capaciformers were adjusted to energize an 8-volt-amp., 100 per cent power-factor burden at a secondary voltage of 63.5 and 30 deg. leading phase displacement. It was found necessary to adjust each capaciformer to the same phase displacement, otherwise voltage distortion would result when connected in star to the relay. Some idea of the range of adjustment on the basis of a 63.5-volt burden is shown in Fig. 4a.

This installation has been in continuous satisfactory service since April, 1933. There have been seven outages of the line, but in all cases the automatic air-break switches functioned as intended. Five of these outages were caused by lightning flashover which did not result in persistent trouble on the line. In the two remaining cases persistent trouble on one end of the line prevented service at that end from being restored, but service to Utica substation was promptly restored by the closing of the switch onto the good end of the line.

Automatic air-break switches of the type used here cannot be used to interrupt fault current and consequently cannot be expected to eliminate momentary interruptions to the station. But, because of the improbability of simultaneous persistent trouble occurring on both sides of the station, they can be relied upon to prevent all long-time interruptions.

Effect economies in cost and save space

The cost of air-break switches is not more than 30 per cent of the cost of the equipment necessary to isolate the station without an interruption in case of line trouble and can, therefore, be used in many places where the more expensive switching station cannot be justified.

The capaciformers are much smaller than standard potential transformers for this voltage and can be mounted on the same pole as the air-break switch. The installed cost of the capaciformers is about half the corresponding cost for potential transformers, and they also make a much simpler and better-appearing job.

Testing at the time of installation should be very thorough to insure that proper voltages are secured at the relays, but once this has been determined an occasional trial of the switch should be all the attention that is necessary.

GLARELESS CEILING UNITS, BRILLIANT MERCHANDISE

A. L. Powell

Direct rays of the ceiling units cannot glare in customers' eyes and attention is directed to the merchandise for sale in E. J. Hickey's shop, Detroit. Egg-crate louvers on the recessed ceiling units direct the light downward into the showcases and on the floor. This illuminaiton is supplemented by tubular line-of-light showcase units backed by cylindrical reflectors.

Getting Acquainted With Our S

Face-to-face Frankness Wins Stockholder Confidence — Experiences That Build Fair Treatment for Utilities

CUSTOMER ownership of stock, when the idea was first introduced, was hailed by the electric utilities as the precise and authentic solution of the public relations problem. To the customer with a newly acquired and handsomely engraved stock certificate in his hand the company had sung, gracemoorishly, "Love Me Forever," and, sure that the customer would do so, the company then had filed the affair under the head of finished business and had gone on to more important matters. But the customer-owner in many cases failed to love the company forever. As a matter of fact, under the proper conditions, he frequently turned from love to hate with that emotional facility that characterizes the human animal.

In the past few years conditions for this transformation have been exceptionally favorable all over the country, and in no state more favorable than in Wisconsin. With the President of the nation displaying an open hostility to the electric utilities and his attitude naturally reflected by practically every officeholder down to dog-catcher, with the newspapers shouting headline accusations of utility criminality and turpitude, with dividends discontinued entirely or cut to a fraction of the stated amount and with utility managements making little or no effort to cultivate stockholder good will, he would be a simple-minded person indeed to be surprised that very often the stockholder had become petulant, not to say irritated, with the company in which he had put his money.

BEAR in mind we are not talking here about the "investor" who has money to invest and who presumably understands and accepts the chances of business. We are concerned with Mrs. Brown, who lives in the cottage just past the Baptist Church and who, on the earnest solicitation of her nephew, then employed by the company but now hoping to get on W.P.A., bought company stock with the $900 of insurance money that was left after the funeral expenses and other debts had been settled up. We are talking about the workman who saved his money and who believed when he was told that it would be safe and would earn a good return in company stock. These are the customer-owners of the Wisconsin Power & Light Company, one in every six customers, 18,000 of them living in the 326 cities, towns, villages and hamlets served by the company. To many of them a dividend suspension or reduction is not merely annoying or inconvenient; it comes uncomfortably close to being tragic. Their minds thus were fertile ground for the seeds of distrust thrown broadcast by politicians and newspapers who shouted and printed that the electric utilities were a vicious swindle and had no virtue in them anywhere. The results of this propaganda began to show in the reports of local managers to the headquarters office at Madison. Instances of hostility of stockholders to the company cropped up, not frequently, in number small, but sufficient to be distressing to conscientious management.

(Inside the fence of these parentheses, let me say that while my knowledge of these conditions is confined entirely to our own company, I believe that they are in greater or less degree typical of a situation that covers the whole country. Any utility executive who cannot see his company's stockholders in this story is still wearing the rose-colored spectacles that went out of style for utility people in 1932.)

WE DECIDED to do something about it. We decided to get personally acquainted with our stockholders, and they, seeing the top management of the company composed of human beings just like themselves, would probably find it not so easy to believe that we were scoundrels of deepest dye, scaly with crime and dripping with the blood of innocent victims. It was possible, even, that we might get some of them to believe that we were really quite decent citizens, doing the best we knew how in a tremendously difficult situation. How should we go about the job of getting acquainted with our stockholders?

Like a lot of other jobs that looked terribly difficult, we found that the really hard part was not how to do it, but to convince ourselves that we actually were going to do it after we had said we would. It is so easy to resolve to perform a meritorious action and then let a real or fancied difficulty conceal from the virtuous part of our nature the fact that we never really intended to do it at all. Having got over the psychological hurdle, we made a simple plan and started to work. The plan was to call meetings of stockholders in each company district, answer the questions that propaganda had put into their minds, suggest an organization officered and controlled wholly by themselves, offer to keep the organization informed of matters affecting their interests both inside and outside the company and promise to consider any suggestions they might advance as to the conduct of the company's affairs. Among the places selected for an early effort was Janesville, a city of 22,000, where there were about 2,000 stockholders.

THE local manager at Janesville was given a list of about 300 stockholders and asked to interview them to find out as specifically as possible on just what points the stockholders were inclined to criticise the company. The points most often recurring in the interviews were five that predominated as well in many other investigations of the same kind. The five points that cropped up oftenest were:

1. Practically all of the stockholders were quite sure that the reason their dividends had been cut was because the greatest part of the net earnings was being used to pay the salaries of the officers. The president of the company was variously supposed to be getting from $75,000 to $125,000 a year and the other officers in proportion. Therefore the first question was, "How much salary does the president get?"

2. The seed of the second question had been planted

Stockholders

By GROVER C. NEFF
President Wisconsin Power & Light Company

by vociferous advocacy of public ownership. Was the development of the Wisconsin Power & Light Company a good thing for the people in the area served by it, or would the people have been happier and better served with electricity if the development had been through municipal or some other form of public ownership?

3. It was freely charged that in the development of the company's system the management had paid more than they were worth for properties purchased and had otherwise grossly wasted money, with the result that the company had an inflated capital structure and that this was the reason why rates were higher and dividends lower than they should be.

4. The statement was widely made and as widely believed that the Middle West Utilities Company had "milked" the operating company and that if this had not been done the company would be in a much better position than it is today.

5. And the stockholders wanted to know how the depression had affected the earnings of the company.

An address was prepared discussing these five points and answering the questions they raised. Briefly, the points were disposed of in the following manner:

1. To the charge that the officers of the company are taking all the profits in salaries, reply was made that the combined salaries of the five top executives amount to only $39,000, which, in comparison with the $1,100,000 required for stated dividends on preferred stock, is very small indeed. And the stockholders were told that if they want to cut the president's salary to $100 per month they would have to be satisfied with that kind of a president.

2. To the question as to whether or not the development of the company was a good thing for the people in the area served, another question was posed. The stockholders were asked to think over what they know about politics and politicians and then to ask themselves if political operation could have brought electric service in twenty years to practically every community in southeastern Wisconsin, could have built 3,000 miles of rural line and given service to 9,000 farm customers.

3. In reply to the charge that in the development of the system money was wasted and properties purchased for more than they were worth, it was shown that more than two-thirds of the entire investment of the company is represented by construction, not purchase. It was shown that the average electric utility investment per customer in the United States is $560, while that of the company is only $483. And then to show how the politician does the job, the figure of the Ontario Hydro-Electric Power Commission was given, $700 per customer.

4. Instead of the company having been "milked" by the Middle West Utilities Company, the exact opposite is true. The actual case is that Middle West took $6,000,000 in dividends from the company and put into it $12,500,000 in capital requirements. Right now the company has $6,500,000 of Middle West money.

5. The reply to the fifth question did more than show what the depression has done to the company. It showed how gross revenue has decreased, how at its lowest point it was jerked down farther by a rate cut, and how economies in operation that should have protected net revenue have had to be used instead to pay rapidly increasing taxes. It was pointed out that with government simultaneously reducing rates and raising taxes there is little chance for stockholders' dividends. It was pointed out that for every share of preferred stock $7 is paid in taxes, and that if taxes were cut in half preferred stock dividends could be restored to their full amount.

When the president of the company went to Janesville to address the meeting he found a much bigger turnout than he expected, about a third of the total number of stockholders in town. After he had covered the five points in the manner of the foregoing paragraphs, he invited other questions. He got plenty, and the tone of them at first indicated that the questioners were sore. However, as it became plain to the people that the president wanted to deal honestly and openly with them, the temper of the meeting changed and the suggestion was approved unanimously that a committee should be elected by those present to deal directly with the president and maintain continuous contact with him.

All stockholders in the division were advised to bring their questions, criticisms and suggestions to the committee for transmittal to the president. The results of the Janesville meeting were found to be good. There was a marked improvement in local relations. The stockholders were glad to get the information on the company's affairs that continually flowed to them and they were pleased to know that the suggestions they made were always seriously considered and frequently adopted with profit to the company. The Janesville organization was formed about a year and a half ago. Since then other groups have been organized in ten divisions of the company, leaving only four divisions unorganized.

[*Continued on page 86*]

One of a Series of Intimate Talks with Industry Executives

Hixon on Quality Materials

An Interview by
H. S. KNOWLTON

PERHAPS something in the tang of the Atlantic breezes which sweep from time to time through the offices of Boston electrical men is responsible for their forthright thinking on industry policies and problems. Even in these days of attempted regimentation by centralized authority New Englanders retain the habit of being outspoken on issues close to their lives. Knowing a man over on the South Boston peninsula who holds strong convictions on the subject of maintaining quality material and construction in electric wiring installations, and whose voice has been raised in support of this thesis throughout his career, I asked Alfred J. Hixon, president of the Hixon Electric Company, to speak to the readers of the ELECTRICAL WORLD on the important matter of standardization. Mr. Hixon had just addressed the Boston convention of the International Association of Electrical Inspectors on co-operation between inspectors and contractors as a constructive element in the industry, and I believe further interpretation of the old problem of quality versus cost would be helpful for consideration in this transitional era.

"Mr. Hixon," I asked, "would you care to define the contractor's position in the industry at the present time, setting aside merchandising functions?"

"I did this before the electrical inspectors," he answered. "I would define electrical contractors as all persons, firms or corporations who install electric wiring or apparatus for hire, who are primarily motivated by the element of profit in such installation. They derive no benefit from the operation of the installation, and so there must be a continuous demand for the installation of electrical facilities if the contractor is to exist. I make this point to indicate how essential constructive development of the industry is to the electrical contractor."

"What is the fundamental requirement of electrical service from the reputable contractor's viewpoint?" was the next query.

"The safeguarding of life and property," said Mr. Hixon. "This is the reason for the development of standards and rules which must be designed to permit expansion of the electrical art on the basis of quality materials and construction. Right now there is considerable pressure upon the industry to cut costs by the utilization of substandard material, such as thin-walled conduit, concentric wire and cheap types of wire assembly, and I firmly believe that if the adoption of such practices becomes standard and is retained, the industry in America and the public which it serves will suffer greatly. I do not mean to imply that concentric wire, for example, is not useful in wiring stone and concrete buildings so common abroad, but certainly its present development does not fit the picture in this country, either from the standpoint of economy or of assured safety."

"How can the most adequate facilities for using electricity be installed with the greatest safety and lowest justified cost?" asked the ELECTRICAL WORLD editor.

"This is a vital question," said Mr. Hixon, bending thoughtfully over his clean-swept desk. "It brings up the whole matter of standards, since in sound criteria of material and workmanship rest the economic and social success of electrical service. By the same token, confusion or misunderstandings of standards lead us directly into trouble with all parts of our industry. I believe our standards need further and extensive improvement along the following lines: (1) Removal of all influences from processes leading to the establishment of standards which are not purely scientific or of an engineering nature, eliminating all questions of special and monetary interest; (2) bringing about a universal acceptance of standards and eliminating confusing and unsound variations in rules applicable to various localities; (3) the building up in the electrical industry of a uniform method of procedure which will lead to uniformity of administration of standards and, hence, greater compliance with them.

"Generally speaking, the electrical contractor who is asked to quote prices on plans and specifications for the installation of electrical equipment and wiring is not particularly interested in the question of the effect which the cost may have on the use of energy, unless he is requested to give engineering advice. He is very vitally interested in the clarity and freedom from ambiguity of the plans and 'specs,' as well as the rules and regulations governing the installation. Uncertainty and ambiguity in these documents lead directly to the root of most contractor troubles, viz., unfair competition, due to intentional or unintentional misunderstandings. It, therefore, should be easy to appreciate what vital importance this matter of standards is to the contractors.

"Wiring costs represent less than 2 per cent of the expense of building a home, and these costs should not be lowered at the expense of safety, high-grade service, or to perpetuate the existence of 'chiseling' contractors or makers of substandard material. Much good can be accomplished by the simplification and better integration of the National Electrical Code, which has grown up more or less like 'Topsy,' but the contracting branch of the industry as represented by the national association desires to see these improvements effected impartially and on the basis of good engineering. In the long run fair prices for quality material and workmanship will best serve the public. Adequate, durable and safe installations are worth a substantial differential above the monetary gage which fits cheap and hazardous material, and if private interests desire to retain their regulatory functions over wiring and installation work they will do well to stand firm for quality, no matter how loudly the price-cutters may shout for letting down the bars."

ALFRED J. HIXON, president of the Hixon Electric Company, is an outstanding electrical contractor whose independent thinking and championship of industry co-operation have won him widespread recognition.

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Buy Now to Serve Later

IT WAS refreshing to meet a utility executive recently who said: "I look for a big load in 1937 and am going to order a power station built at once." He knows that it takes two years to build a power station and has faith in the future. Yet many executives appear to think that the industrial up-turn now occurring is a flash in the pan and are filled with Douglasonian gloom. It is a mood rather than a conviction. But it is not in accord with the spirit and the action that have made the industry win its battles in the past. The demagogs and the scallawags must be shown up, but not to the neglect of the obligation on executives to anticipate and meet service needs. A look at the properties and the loads is needed as well as one at the courts and corporate structures.

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Good Work by I.C.I.

ONE of the most effective international co-operative movements deals with illumination. The International Commission on Illumination met in Germany in July and the reports of the several committees as well as the general agreements reached marked a step forward in the art. Agreement was had for "lm." and "lx." as abbreviations for lumen and lux, respectively. The primary standard of light was accepted as a black body at a temperature corresponding to that of the solidification of platinum. Minimum standards for lighting were agreed to for several applications, including 100 lux for design and sewing rooms, 80 lux for classrooms, 30 lux for auditorium and general meeting places and 20 lux for recreational areas, corridors, halls, etc. These are items in a large program.

Some of the best work of the conference was done in highway and aviation lighting. Steady progress is being made toward agreement and the plans for work outlined by the several committees is certain to bring out new and much-needed information. Light is still in process of growth and this international commission on illumination should be supported wholeheartedly by the industry. It does good work.

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Engineers Begin to Awaken

A LONG-CONTINUED vacation in engineering is over. The utility and industrial electrical engineer says: "I have been making a lot of analyses and studies, but have not constructed anything in five years." The engineer of the manufacturer says: "I have been in the factory developing and improving products for five years and wonder what is going on in the field." Both types are out of practice, in a general sense, out of contact with broader aspects, and require new knowledge and technique to meet the engineering needs of revived industry. Product knowledge must go to field engineers; field knowledge must go to product engineers.

Expansion in all industry now means greater use of electricity and electrical products. Steel, automotive and other industrial plant rehabilitations take the electrical road. Utility expansion means a more intensive loading of existing facilities and additions to these facilities. Engineering success necessitates a detailed study of the new application problems, a complete knowledge of the new products now available, and the ability to bring these two elements together. Engineering is now in the marketplace.

We know engineers will awaken to present opportunities. They will apply new knowledge with a proper perspective to meet present and future conditions. A home is now a 10- to 15-kw. application in being. An industrial plant is a succession of new-production and material-handling processes based upon electrification. The magnitude and rate of electrical industry growth, therefore, lie in the hands of its engineers. The limiting factors are not found in electricity or in electrical products, but in the ability of engineers to use these tools intelligently. Encouraging indications are cropping up to show that engineers are aware of the changed conditions and are seizing their opportunities to again go to work. They like to do things and welcome the demand market that is growing so rapidly.

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New Maintenance Standards

THE period of rapid expansion of the electric light and power industry was the decade 1920-30. That was the period of extension and integration of scores of properties, of the building of vast high-tension transmission networks, of the development of subtransmission loops and distribution centers and of establishment of modern standards of electric service. The maintenance of this large mass of equipment has been in accordance with standards set up as a general rule at or about the time the equipment went into service,

and was, undoubtedly, adequate at that time. In most cases the same standards of maintenance have been followed during the depression half decade 1930-35.

But it is necessary to remember that this equipment has been getting older. Whereas the average age of a good deal of equipment was five years in 1930, the average age of the same groups of equipment doubled in the last five years and is now ten years. At such an age dozens of factors influencing reliability and breakdowns have had ample time to make themselves felt for the first time, and generally do. Thus, plain wear and tear on mechanisms of various sorts, erosion and corrosion, freezing and thawing, weathering and cavitation, moisture and dirt, sludging and acidification of oil, repeated short-circuit stresses on windings, cumulatve lightning shocks and overloads, individually or collectively, have had time to contribute to reduction of safety factor and life. On top of this, some classes of equipment are today operated on a more strenuous duty cycle than ever.

If this broad cycle is followed uninterruptedly it is obvious that the only possible result is a sharp increase in the number of equipment and apparatus failures and a lowering of the standards of service. But, since the latter is an inadmissible condition, the only course left is a sharp revision upward of the standards of maintenance. In many cases this may mean a radical and complete change in maintenance methods. Equipment that has been receiving casual and only visual inspection may have to be subjected to periodic, thorough overhauling. More thorough testing may have to be done, and even new methods for doing this may have to be devised. Is there any other alternative?

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More About Sales Planning

APPLY the fundamentals of merchandising to the sale of electric service! The fitness of this advice, coming, as it does, from so keen an outside observer as American Managements Association's vice-president, Alvin E. Dodd, is doubly significant. There is no place for sloppy sales planning at a time like the present, when every kilowatt of added load is needed by an industry caught between the vise-like jaws of increased costs and decreased revenue.

A sharp-shooting approach to the problem of load building will obviate much of the lost motion in these campaigns. Classify the market. Find out who the unprofitable customers are, group them by class, revenue and annual power usage, discover where to apply sales pressure, and then apply it. With market knowledge available and customer interest aroused, a selling attack based on dealer and employee co-operation, backed by a competent and live sales force, is bound to result in not only added load but fuller service to an appreciative public.

The Road to More Refrigeration Load

THE power industry has done its best load-building job with the domestic refrigerator. Seven million of them have been sold in a relatively short time. Enough have been put on the lines during the depression to lift the summer valley of the industry's load curve and build back the bulk of the losses in industrial business caused by unemployment. Refrigeration has been a great commercial experience for the power companies.

Not the least important part of the experience has been the discovery of the tremendous selling power of the dealer. With prior appliances the manufacturers always brought the new device to the utilities to introduce and things went slowly. After all, the power company was one trade outlet, one voice in the marketplace, among so many. Dealers were hesitant because there was no public demand. But when the refrigerator manufacturers finally stepped out to sell this idea to the American home, they made some history. They built up a great network of independent dealers, gave them profit enough to make the business attractive and then backed them with a pressure of consumer advertising that rapidly created a public demand. In a word, they sold the refrigerator as other successful consumer specialties are always sold.

The dealer has built the household refrigeration load for the power companies. True, the utilities created the local refrigeration bureaus, provided demonstrations and local advertising and themselves sold a goodly number. But dealer man-power put the campaign over and is selling 80 per cent of the refrigerators today. And now, having skimmed much of the cream of this market, the utilities are turning to the rental and sale of small refrigerators to minimum bill customers. It opens up a whole new field. But if it is to go over in a big way, the dealers must still do the heavy work.

It is because of all this that the comparison of the recent experience of eighteen power companies, on page 71 of this issue, is worth some study. This group embraces utilities outstandingly successful in selling refrigerators last year and the relation of company and dealer sales is particularly interesting. In some cities the utilities are selling an abnormally high percentage; in other cases few. And whether the proportions should be 20 to 80 per cent is hard to say. But a balanced co-operation, in which both utility and dealers are aggressively selling, will achieve the maximum in load, and this balance should be sought in every city.

Refrigeration business is still good. There are a large part of, say, 12,000,000 homes still to be sold on some basis. The road to this vast load still leads through the dealers' stores. And the most important consideration of the utilities should be the fostering and development of this dealer volume.

· TRENDS ·

THE EDITORS USE A SPOTLIGHT ON CURRENT HAPPENINGS

Frank C. Jones Says:

"PRICES and wages have always been governed by economic law, and, I think, always will be so governed. We may not like the law of supply and demand, but I know that neither the New Deal nor Congress can change it, and I am convinced that any legislation attempting permanently to fix prices or wages will only retard prosperity." We agree with him.

Customers to Stockholders to Public

POLITICIANS who believe the public is dissatisfied with the cost of electric service are mistaken, but evidence is needed to convince them of this fact. Utilities will do well to obtain this evidence, for the opinion of the great mass of customers added to that of the security holders would go far to cause politicians to hesitate in their attack on utilities. One significant survey, published in the July issue of *Fortune*, showed that 53.9 per cent of the people interviewed considered their electric bills reasonable as against only 41 per cent who thought their tax bills unreasonable. It is significant that the entering of government into the power business increases this tax bill. There are many facts the public should know and the industry should obtain them and present them.

Where Is the $100,000,000

THE R.E.A. apparently finds that rural electrification is no easy project to launch. Many months have elapsed, but no money has been spent. Private utilities shied off when it came to signing on the dotted line and went ahead on their own funds. The farm co-operatives get weak-kneed when it comes to signing contracts and, in addition, R.E.A. finds it quite difficult to set up a rural project that will sustain its operations and support some one capable of constructing and managing it. Despite the ballyhoo and political pressure, R.E.A. has tried to do a good job. But the chief result to date has been to spur private utilities to do the rural electrification work now as in the past. Perhaps this was the real object.

Jobs for Thousands

NEW customers are coming on the lines at a considerably faster rate than in 1934. During the first six months of the current year more than a third of a million additional homes, including those on farms, received electric service. That is 70 per cent of the increase during the whole of last year. It is equivalent to an annual rate of gain of 3 per cent. It is well over a third of the increase in the entire year 1929, which, it will be conceded, was quite an active year for the electrical industry. The conditions applying to the serving of these new customers cannot be known. They probably called for little increase in power plant capacity, but they certainly required in meters, distribution and substation equipment, as well as in wiring, fixtures, lamps and some appliances, an immediate investment of the order of $100,000,000. Most of it ultimately went into wages, in many different industries—just one example of the way utilities build employment.

Budget-Making Time Is Here

MANUFACTURERS are making sales budgets for 1936. In the electrical industry these will average about 30 per cent over 1935. Utilities are also busy with budgets and operators find that they will need to increase capital expenditures next year. But top executives in the utility field are reluctant to approve these increased budgets. They do not believe the business up-turn is sound or they want to postpone commitments to the last minute. They have the money, but are not in the mood to spend. A close scrutiny of the underlying facts shows that the manufacturers are more nearly correct in their analyses of conditions. Utilities will need to add or strengthen service facilities in 1936 and postponement of commitments is an expensive business policy to follow. It takes time to make and to install equipment. It is necessary to look ahead to 1937 in these matters if service is to be maintained.

Edison Foundation Launched

FOR some years the Thomas Alva Edison Foundation has discussed ways and means to honor the memory of Mr. Edison. Last week the plans were announced for a tangible and living memorial to the great inventor. The Edison Center and the broad plan to encourage the development of young engineers and scientists are sound objectives that should receive the support of all electrical men as well as the people of the nation. With O. D. Young as chairman of the honorary committee and with a well-organized plan the foundation is certain to suceed.

Melody Master Series Starts

THE silence of the electrical industry over the radio is a thing of the past. The "melody master" program, co-sponsored by the General Electric Company and thirteen utilities, is to promote Better Light-Better Sight, but indirectly carries the complete idea of electricity to the public. The radio is a tool to be used by the industry that developed it and we hope this type of program with more utility sponsors will be supported and promoted on a national scale. As a first step better lighting as a theme is admirably chosen. This is an aspect of the business that has public appeal and that can be promoted over the radio. It is to be hoped that local utilities in all sections will join in this much-needed movement.

Advice to the Contractor

"YOU know that the public which are our customers have very little knowledge of electrical rates. They only know they paid so much last month, and that the bill is higher this month—it is too much. What they get for their additional cost is of no concern. Perhaps they have installed an ice box, or an oil burner, or a reading lamp, but at the moment when reviewing their bill they forget these items, and if you agree with them that the bill is too high, you are driving business right out the front door."—*A sound statement by F. T. Langford at the recent meeting of the National Electrical Contractors Association.*

High Court to Give T. V. A. Ruling

Agrees to renew case brought by Alabama Power Company stockholders — Memphis contract protested by local utility — Eighty miles of 224-mile transmission line completed

The United States Supreme Court has agreed to review the suit brought by George Ashwander and other minority stockholders of the Alabama Power Company to set aside a contract involving the sale of certain transmission lines by the company to the Tennessee Valley Authority. The suit was originally decided in favor of the plaintiffs by Judge Grubb of the U. S. District Court in northern Alabama, who was subsequently reversed by the U. S. Court of Appeals at New Orleans. The suit will be argued on December 16, James L. Fly, T.V.A. general solicitor, said.

Memphis contract delayed

Protest has been filed by the Memphis Power & Light Company against the signing of a contract by the city officials of Memphis, Tenn., for the purchase of electricity from T.V.A. for a municipal system. The action came after the Memphis Light and Water Commission had approved the contract and it was to have been signed October 16, but action was delayed until the matter can be given further study. The power company officials contend that the contract should not be signed because: (1) Success of T.V.A. depends on the increased use of electricity, especially for cooking and water heating, but in Memphis the price of natural gas makes gas cheaper for cooking and water heating than electricity would be at T.V.A. rates; (2) the building of a second electrical system would mean surcharges in addition to the T.V.A. rates so that the actual cost of T.V.A. electricity would not be substantially below the present charges; (3) the distribution system recommended for the proposed municipal electrical system is not adequate; (4) the courts have yet to say whether the city government and T.V.A. have a right to make such a contract as proposed, and (5) Congress has stated that the government policy is to avoid competition with existing facilities.

Terms of the contract call for furnishing T.V.A. power at standard T.V.A. rates, but these rates will not be in use in Memphis until sales by the city reach a point at which it is profitable for the city to use them. In the meantime, the rates to be actually paid will be fixed by the city commission and the light commission by means of a surcharge to be added to the standard T.V.A. rates. The contract is to run for twenty years from the first delivery of T.V.A. power. T.V.A. is to provide the transmission line, with rights-of-way to the city limits.

Contracts for T.V.A. power over a twenty-year period have been signed by Jackson and Somerville, Tenn.

Eighty miles of the 224 miles of the main high-tension transmission line connecting Wilson, Wheeler and Norris Dams have been completed, according to an announcement made recently by the Tennessee Valley Authority. The entire mileage is scheduled to be completed early in February, 1936.

The 80 miles completed to date, together with the Tennessee River crossing at Wheeler, is on the section between Wheeler and Dechard. The remainder of this section in varying stages of construction will be completed by November 1.

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Memorial Plan Announced by Edison Foundation

Owen D. Young will serve as national chairman of the country-wide movement to honor Thomas Alva Edison by the establishment of a program to keep alive the ideals of the great inventor, it was announced October 21 by William S. Barstow, president of the Thomas Alva Edison Foundation. National vice-chairman will be George B. Cortelyou.

The Edison Center for the Advancement of Youth in Science will comprise the physical setting from which a wide educational program will be developed, with emphasis on the encouragement of youth in the pursuit of scientific knowledge, to be an ever-living memorial in keeping with Edison's life-long services to mankind, and particularly to youth.

The basic memorial will include facilities for the permanent care of Edison's personal library, which is probably one of the most valuable scientific libraries in existence, his records and papers, and originals or replicas of each of the more than one thousand inventions which he developed. The plans also include provision for a final resting place for the great inventor. Menlo Park, the scene of Edison's early activities, will be marked by a simple and impressive shaft as a part of the general memorial program.

Doherty Terminates Cities Service Pact

Contracts providing for supervision of holding company cancelled — Henry L. Doherty retains chief executive position — Stock holdings large

Henry L. Doherty & Company, which since the formation of the Cities Service system in 1910 has rendered financial and managerial service to its subsidiary properties, has canceled all its contracts with the parent company and its various subsidiaries and henceforth will be devoted strictly to managing the personal affairs of Mr. Doherty.

"The change," Ernest H. Johnston, vice-president of Cities Service, explained, "will simplify bookkeeping. Hitherto, Henry L. Doherty & Company have acted as fiscal agents for the Cities Service System. From now on the Cities Service companies will act as their own fiscal agents and will manage their own affairs. The capital structure of Cities Service will remain unchanged."

At the same time Mr. Doherty will retain his stock interest in Cities Service Company and will continue to be its chief executive officer. His voting interest in the company amounts to 27 per cent, sufficient to give him working control of the $1,270,000,000 combination.

Henry L. Doherty & Company was formed as a partnership in 1905 when Mr. Doherty and Frank Frueauff became interested in public utility properties. When Cities Service Company was formed in 1910 Henry L. Doherty & Company managed and financed the new enterpise. A large part of the stock interest of Mr. Doherty in the Cities Service Company is held by him through Henry L. Doherty & Company, which has been a personal company since the death of Mr. Frueauff in 1922.

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New York Power Plan Vote Blocked by Courts

The Appellate Division affirmed unanimously the recent decision by Supreme Court Justice Edward S. Dore enjoining the city of New York from submitting to the voters in the coming election a referendum on Mayor LaGuardia's proposed municipal "yardstick" power plant (ELECTRICAL WORLD, October 12, page 43). No opinion ac-

companied the court's ruling. The city carried its case to the Court of Appeals in Albany, which unanimously upheld Justice Dore's decision.

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First R.E.A. Allotments Made to California

Announcement was made this week by the Rural Electrification Administration of an allotment of $700,000 to the Imperial Irrigation District of California for 500 miles of transmission and distribution lines to serve 1,500 families. A previous allotment of $295,000 to Southern Sierras Power Company was also announced, though made some time ago, for a separate project in the Imperial Valley. Neither loan will be available until settlement of court orders now restraining both organizations from construction.

Eleven additional loans in seven states aggregating $5,000,000 will be announced as soon as final details of contracts have been decided upon. The Imperial loans are on a 3 per cent twenty-year basis to cover the entire cost of self-liquidating projects.

Calling attention to the need for a set of simple and uniform standard practices governing the construction and operation of rural power lines, the Rural Electrification Administration summarized recently what appear to be the best current practices employed by forward-looking utilities and public service commissions.

The summary recommends the elimination of service or other fixed charges which do not include any current. It notes that a minimum charge normally should not exceed $3 to $3.50 per month, for which from 40 to 50 kw.-hr. of energy should be supplied. The summary indorses the application of line extension rules to entire districts, with costs averaged rather than worked out piecemeal for each customer as he signs up.

Duke Power Company proposes to complete by January 1 500 miles of rural lines in the Piedmont section of the two Carolinas, according to E. C. Marshall, vice-president. Mr. Marshall says that so far this year the company has built 473 miles of rural lines, and that this total will be run to 500 by the end of the year. With this record for 1935, Mr. Marshall says that there is no question that the Duke Power Company will authorize the building of 500 miles of rural lines in 1936.

In order to encourage the extension of municipally operated power lines into rural territory the R.E.A. will send representatives to a conference of municipal plant managers and operators to be held November 7 and 8 in Kansas City, Mo.

Participation of the federal government in the activities of the Committee on the Relation of Electricity to Agriculture has recently been withdrawn.

New Federal Regulatory Powers Discussed by State Commissioners

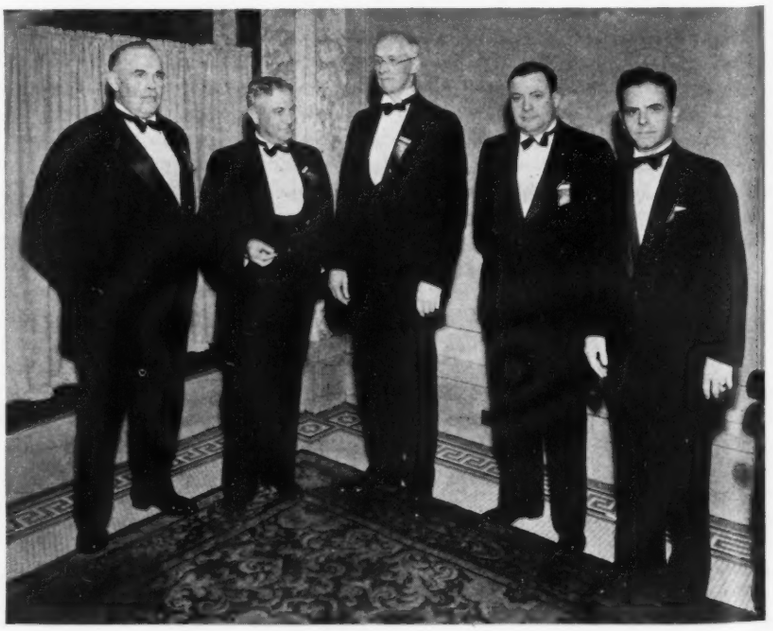
Opionion differs among state utility commissioners whether the new federal regulatory powers in the field of power, telephones, motor carriers and securities will immediately denude them of their powers to regulate or whether these new agencies will, on the other hand, serve nicely to close up the gaps in regulation as asked for the states themselves. At the annual convention of the National Association of Railroad and Utilities Commissioners in Nashville last week members of each of the four boards—Federal Power Commission, Federal Communications Commission, Interstate Commerce Commission and the Securities and Exchange Commission—gave hearty assurance that they had no intention of encroaching upon the rights of the states to regulate and police, but, knowing the history of railroad regulation, the state men were more concerned about defining mutually exclusive jurisdiction than about the outcome of the mutually tendered offers of co-operative functioning.

Rates and accounting

There was noted a confused allocation of authority about rates and accounting, even though Solicitor Benton insisted that the Federal Power Commission had jurisdiction solely over rates for wholesale energy for resale. Commissioner Hooker of Virginia foresaw a serious loss to state prestige in spite of his reservations for state authority written into the Wheeler-Rayburn measure, largely at the relentless insistence of the commissioners' association. He feared interpretation of the energy interchange clause can be so broad as to destroy utterly state regulation. Others, including Hugh White of Alabama had less misgivings, rather welcoming the aid now available to states out of Washington. Progressive construction of the clauses and subsequent personnel alone will reveal whether regulation of household utilities will go all-federal like the railroads. F. J. Schaaf of Olympia, Wash., predicted, however, that in a short time the states will have little left of their present powers to regulate if the trend is not reversed. In any event the state commissions have been thrust into a new defensive solidarity.

Several actions of direct interest to electric utilities occurred. A draft of a new uniform system of accounts was ordered printed for circulation and comment. It largely follows the Wisconsin code discussed a year ago. Also received was a rate committee report which urged nation-wide simplification, commended the simple block rate with service charge concealed if present at all and frowns

UTILITIES COMMISSIONERS ELECT NEW OFFICERS



At the recent meeting in Nashville the National Association of Railroad and Utilities Commissioners elected new officers for the period 1935–36. They are (left to right): A. R. MacDonald, Wisconsin, retiring president; Frank P. Morgan, Alabama, incoming president; Thomas E. McKay, Utah, first vice-president; Alexander M. Mahood, West Virginia, second vice-president, and Clyde S. Bailey, secretary.

upon the direct service charge as scientifically correct but psychologically impossible.

Survey of the trend in valuation by E. I. Lewis of the Interstate Commerce Commission showed a pronounced trend toward the requirement of a continuous inventory like that in litigation in New York. By resolution the association will memorialize the legislatures in the interest of more adequate budgets for the commissions. Another resolution favored federal regulation of interstate gas lines, thus inviting inescapably more of the federal invasion which is already making them quiver.

Forty-two states and Hawaii were represented by about 250 delegates, many of whom took the subsequent three-day trip to Muscle Shoals and Norris Dam with T.V.A. as host. Commissioner Frank P. Morgan of Alabama was elected president.

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State Planning Groups Report on Power Problems

The importance of low-cost electric power in building the economic and social welfare of communities throughout the country is emphasized in a report by the National Resources Committee, made public this week, on electric power problems encountered by state planning organizations. Summarizing studies by state planning groups, the report indicates that the states recognize a dual problem: (1) The necessity of developing sources of electric power that can be sold at low rates, in regions where it is lacking; (2) the need for developing outlets for large supplies of such power where it does exist or will in the future. The report is a part of an inclusive survey of state planning in the United States by the National Resources Committee to be released in a few weeks.

Rural electrification occupies the attention of many state planning organizations. Most of the states agree with Indiana that future agricultural developments, and especially the creation of farm industries, depend to a large extent on the availability of adequate electric facilities. The report states that "another object of rural electrification is to give the farm home the same advantages of household labor-saving devices as have lightened the work of the city housewife."

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220-Kv. Cable in Paris

A three-phase, 220-kv. underground cable installation to carry a load of 160,000 kw. is being installed in Paris. It ties together two substations of the Inter-Paris Société d'Electricité de Paris and Union d'Electricité. The cable is oil filled, single core of the Pirelli type. It has a copper section of 0.55 sq.in. and an over-all diameter of 3.35 in.

Power Commission Adopts Rules for Administering Utility Act

To clarify proceedings, the Federal Power Commission sends rules of practice to utilities — Roraback moves to merge properties — Brief filed in defense of utility act

Rules of practice to govern proceedings under the Federal Power Act of 1935 (Title II of the Public Utility Act of 1935) relating to public utility companies have been adopted by the Federal Power Commission and copies of the rules sent to all operating electric utility companies.

In the letter of transmittal with which the copies were inclosed it was pointed out that the new rules in no sense supersede or nullify the rules of practice previously promulgated by the commission for licensees under the Federal Water Power Act of 1920. "Those rules of practice are still in effect," the letter states, "and where licensees are also public utilities under the act of 1935, the subject matter will determine which rules of practice shall govern."

The new rules govern the proceedings before the commission under the act of 1935 for applicants, complainants, petitioners, defendants, interveners, protestants and respondents and define each of these parties.

The Federal Power Commission early this week notified public interstate electric utility officials that Friday, October 25, was the deadline for them to make application to hold office in more than one company. Only about 54 of a possible 2,500 officers have applied to date. Commission officials said they believed the dearth of applications was due to a lack of knowledge of the requirement.

Connecticut utilities to merge

Steps were taken October 17 by Connecticut's largest electric light and power interests to merge a holding company into its operating corporation to escape control by the Securities and Exchange Commission. J. Henry Roraback, president of the Connecticut Electric Service Company, which holds all the common stock of Connecticut Light & Power Company, the state-wide operating unit, of which he is also president, announced the program.

United Gas Improvement Company of Philadelphia controls the Connecticut Electric Service Company with its ownership of more than 60 per cent of the stock. Under the plan the stock would be exchanged share for share with Connecticut Light & Power Company stock. The special meeting of Light & Power stockholders is called for November 18 to ratify the plan.

Connecticut Power Company has applied to the Securities and Exchange Commission for exemption as a holding company and for the exemption of all of its subsidiary companies as such from all of the provisions of the Public Utility Holding Company Act of 1935 on the grounds that "your applicant and all its subsidiary companies are predominantly intrastate in character and carry on their business substantially in a single state, namely, the State of Connecticut, in which state your applicant and every subsidiary company thereof are organized."

Irving Trust Company, as trustee in bankruptcy of the National Electric Power Company, the National Public Service Corporation, Seaboard Public Service Company and the Electric Management & Engineering Corporation, also filed application for exemption on the basis that the holding company system involved no longer exists. The National Electric Power system was the Eastern group of the Insull utilities organization.

New S.E.C. lobbying rules

Tentative regulations to control lobbying by public utility companies have been drawn up by the Securities and Exchange Commission. Promulgation of the regulations is expected soon. The regulations are to cover not only appearance by utility representatives before the S.E.C., but also before Congress, all its committees and the Federal Power Commission.

Davis plea fought in brief

Submitting arguments in defense of the constitutionality of the Public Utility Act, attorneys for Burco, Inc., have filed with Judge William C. Coleman in United States District Court in Baltimore a brief in which the court was asked to direct trustees of the American States Public Service Company to register with the Securities and Exchange Commission in accordance with the act. Burco, Inc., entered the proceedings as an intervening petitioner, after trustees of the American States company, which is under jurisdiction of the court under Section 77b of the Bankruptcy Act, had asked the court for instructions whether to comply with provisions of the act. Another intervening petitioner, Dr. F. Lautenbach, who is represented by John W. Davis, already has filed a brief attacking the constitutionality of the act, contending that the court should retain jurisdiction for the purpose of reorganizing the company (ELECTRICAL WORLD, October 12, page 43).

District Supreme Court Dismisses P.W.A. Cases

Facilitating an immediate appeal to a higher court, the Supreme Court of the District of Columbia on October 14 dismissed three cases brought by utility companies to block P.W.A. loans to eight cities for municipal power plant construction. These cases now go to the District Court of Appeals, where a simiiar case brought by the Oklahoma Utilities Company against a loan to Hominy, Okla., has been argued and a decision is pending. It is believed that the higher court will hear arguments on some, at least, of the additional cases before handing down a decision.

The dismissals applied to cases brought by the Alabama Power Company and the Texas Utilities Company against Administrator Ickes of P.W.A., seeking injunctions against P.W.A. loans and grants to the cities of Decatur, Florence, Tuscumbia, Sheffield, Guntersville, Russellville and Hartsell, Ala., and Plainview, Tex. Additional dismissals are expected shortly on other pending suits in the same court brought by the Gulf States Utilities Company (Littlefield, Post and Huntsville, Tex.) and Kansas Utilities Company (Burlington, Kan.).

Continuation of the power and rate surveys started by the Federal Power Commission in 1933 has been assured by the allocation of $200,000 from P.W.A. funds for this purpose. The money will enable the commission to carry on the work until about February 1, 1936, by which time Congress is expected to appropriate additional funds.

Proposal to create a little "T.V.A." in Nebraska has been approved by heads of the state's three P.W.A.-financed hydro-electric projects. K. Sewell Wingfield, assistant director of P.W.A.'s power division, commended the plan to link the three projects—the Platte River Valley Power and Irrigation District, Loup River Public Power District, Tri-County Power and Irrigation District.

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New Power Deal Offered in Ontario

Bondholders of Maclaren-Quebec Power, Gatineau, Beauharnois and Ottawa Valley Companies, meeting in Toronto last week, endorsed a plan for refunding aggregate bonds outstanding, at a lower interest rate, with government guarantees. The plan also provides means whereby the Ontario Hydro Commission would be able to accept additional power as stipulated in contracts and distribute it to farmers of Ontario at not more than $4 per horsepower, apart from the cost of building transmission and distribution lines.

The proposal was outlined by I. E. Weldon, K.C., on behalf of the bondholders' committee.

The Ontario Hydro Commission has recommended to Premier Hepburn of Ontario that the Power Commission Act of 1935 be forthwith proclaimed. "The commission," the resolution read, "advises that it is in position to carry on its operations and give all essential services to the power and light users of the province without dependence on power supplied under the agreements mentioned in the said act."

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Electrochemists Record Battery and Furnace Progress

Intimation that a lead battery with improved characteristics, requiring, however, only half as much lead, is likely to be the early result of current research was given at the recent Electrochemical Society convention in Washington, D. C. Prof. C. G. Fink of Columbia University voiced this rumor, which may portend a revival of battery-operated vehicles. One of the papers reported a Willard storage battery which has low discharge rate, better standing and shelf life, and is thus competitive with dry cells. A power man's question brought the answer that the battery is well adapted to standby service.

Charts were afforded in two papers to effect a transfer from one set of dimensions, cell details, temperature, discharge rate, etc., to another when applied to storage and dry cells, respectively. These are viewed as reconciling to a considerable extent the disparities in rating and life that are indicated by varying test conditions.

In the symposium on dry cells it was brought out that 50,000 metermen are using up a million flashlight bulbs and five million flashlight cells every year. With the other flashlight uses this makes this $11,000,000 industry one of the largest founded on electrochemistry. The convenience of this source of portable light offsets the fact, cited by J. D. Ceader of Nela Park, that the energy costs over all about 600 times as much as when converted in a 15-watt, 110-volt Mazda lamp.

Announcement was made by M. L. Martus of the Waterbury Battery Company of two caustic soda primary batteries of new design which afford 4 to 15 amp. draft with good voltage to 500 and 1,000 amp.-hours respectively. These cells have visual indication of exhaustion and an automatic closed circuit release and are being used, fourteen to eighteen in series, for highway crossing lights and wigwags.

Higher furnace temperatures are said to be demanded for expansion of electrothermics into, for example, the ceramic industry, the present 1,100 deg. C. limit not being high enough to do much more than "toast" ceramic products. N. R. Stansel of Schenectady sees much hope for present and future high temperature resistors as the controlled atmosphere trend is extended although the nice freedom from difficulties exhibited by nickel chromium may not be fully preserved.

There was some skepticism about the temperature of 3,000 deg. C. and life reported for a French design of rocking furnace which has three-phase resistor heaters at the axis and is rotated fast enough to keep the thoria lining from flowing. As for the behavior of graphite at this unusual temperature, an Ajax engineer reported neck condensation of carbon vapor at 3,600 deg. C. in a 2,000-cycle water-cooled induction furnace of experimental design.

W. B. Wallis (Lectromelt), in his paper discussing electric melting of plain carbon steels, cited a cost of $19.70 per ton in the new top-charge furnace against a representative figure of $21.66 for side charge design. The savings are principally in labor energy and electrode consumption.

COMING MEETINGS

Indiana Electric Association — Purdue University, Lafayette, Ind., November 7-8. Tom C. Polk, secretary, 609 Traction Terminal Building, Indianapolis, Ind.

Arkansas Utilities Association—Annual convention, Arlington Hotel, Hot Springs, Ark., November 25-26. R. E. Ritchie, secretary-manager, Arkansas Power & Light Company, Little Rock, Ark.

American Physical Society — Johns Hopkins University, Baltimore, Md., November 29-30. W. L. Severinghaus, secretary, Columbia University, New York, N. Y.

American Society of Mechanical Engineers—Engineering Societies Building, New York, N. Y., December 2-6. C. E. Davies, national secretary. 29 West 39th Street, New York, N. Y.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 28-31. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

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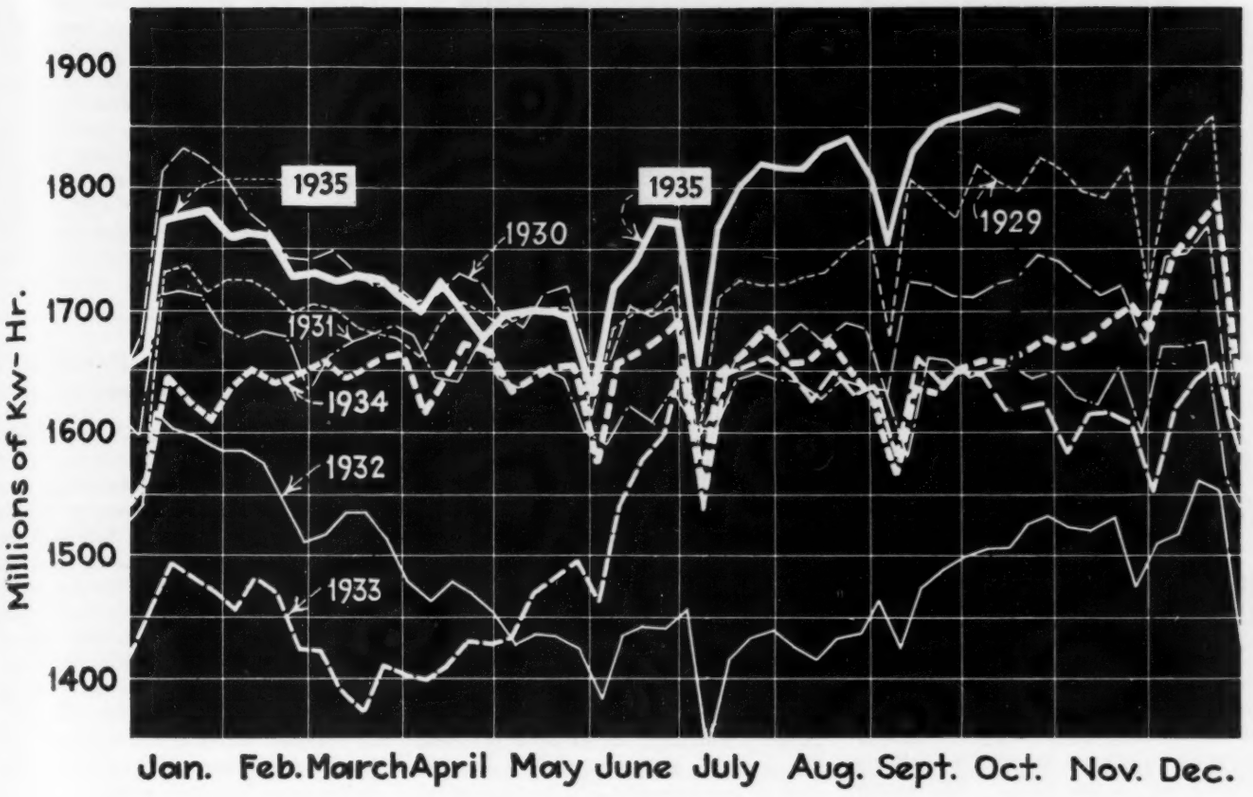
Senate Committee Appointed for California Power Quiz

Investigation by a state Senate committee will be begun at once into the entire power and water situation in California. Acting in accordance with the authority given him in a resolution passed at the recent session of the Legislature, Lieutenant-Governor Hatfield named a special committee of five senators to conduct the proposed investigation. An appropriation of $10,000 has been made available for the work.

The committee will conduct an exhaustive investigation into the feasibility and practicability of centralizing in the State of California the ownership, conduct and control of public utilities as far as water and power are concerned.

Output at New All-Time High



For three consecutive weeks the output of central stations, as announced by the Edison Electric Institute, has exceeded that of the peak week of the winter of 1929-1930. Production has been around 1,863,000,000 kw.-hr., rising to 1,867,-127,000 kw.-hr. in the week ended October 12. The margin of excess thus far has been small but the figures point to an unprecedented maximum next December. The gain over the corresponding period of 1934 approached 12 per cent, this rate having been maintained, with little variation, since the middle of August. Compared with 1929 operations are up 3.5 per cent.

The Rocky Mountain region continues to lead in the improvement over 1934; the shrinking percentages are explained by the vigorous rise that set in a year ago. In the Midwest last week's increase over a year ago, reflecting heightened industrial activity, was 16.8 per cent, which is also the five-week average. The New England average for the past two weeks was 13.2 per cent.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
Oct. 19...1,863	Oct. 20...1,668	Oct. 21...1,619
Oct. 12...1,867	Oct. 13...1,657	Oct. 14...1,619
Oct. 5...1,863	Oct. 6...1,659	Oct. 7...1,646
Sept. 28...1,857	Sept. 29...1,649	Sept. 30...1,653
Sept. 21...1,852	Sept. 22...1,631	Sept. 23...1,639
Sept. 14...1,828	Sept. 15...1,634	Sept. 16...1,663

Per Cent Change from Previous Year

Region	Week ended Oct. 19	Oct. 12	Oct. 5
New England.....	+12.6	+13.9	+10.1
Middle Atlantic....	+ 7.4	+ 7.6	+ 7.5
Central Industrial...	+16.8	+18.7	+17.3
West Central	+13.6	+11.5	+ 6.6
Southern States.....	+ 5.3	+ 5.8	+ 8.6
Rocky Mountain....	+25.8	+29.6	+35.7
Pacific Coast.....	+ 8.0	+ 6.5	+ 7.4
United States....	+11.7	+12.7	+12.3

Appalachian Electric Wins New River Decision

U. S. District Judge John Paul at Harrisonburg, Va., has denied the federal government's motion to strike out the answer of the Appalachian Electric Power Company to the government's petition for an injunction restraining the company from constructing a hydro-electric plant on the New River at Radford, Va., without obtaining a federal license. Judge Paul held that the navigability of the river, in the light of the utility company's answer, presents an issue of fact to be established by evidence and is not a fact to be judicially noticed as a matter of law. A hearing will have to be held to establish the navigability of the New River as a result of the decision.

Arguments on the government's motion were heard several weeks ago. Huston Thompson and Allen Jones, special assistants to the Attorney-General, and Edward Ryan, chief counsel for the Federal Power Commission, represented the government. Newton D. Baker, formerly Secretary of War, and Raymond Jackson of Cleveland argued for the Appalachian company.

New York Metal Prices

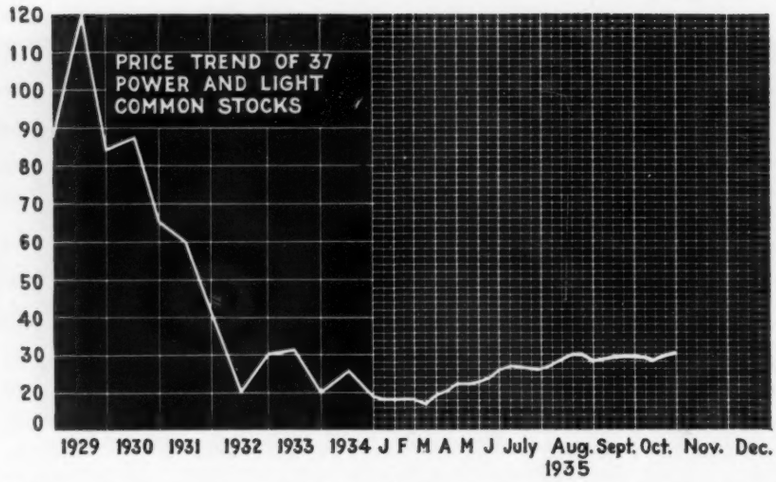
	Sept. 25, 1935 Cents per Pound	Oct. 23, 1935 Cents per Pound
Copper electrolytic.....	9.00*	9.25*
Lead, Am. S. & R. Price..	4.50	4.50
Antimony.....	14.00	16.375
Nickel ingot.....	35.00	35.00
Zinc spot.....	5.124	5.225
Tin Straits.....	48.875	51.00
Aluminum, 99 per cent..	19—21	19—21

*Delivered Connecticut Valley.

Russia Joins Commission on Illumination

The U. S. S. R. has been admitted to membership in the International Commission on Illumination, according to an announcement by G. H. Stickney, president of the United States National Committee. With the addition of Spain, which was admitted to membership during the convention in Germany last July, there are now seventeen countries affiliated with the commission.

Utility Stocks Advance



Substantial gains were recorded by electric light and power stocks during the past week. "Electrical World" index, 30.7, the highest point since mid-August; last week, 29.8.

Byllesby Management Under New Board

Heads of operating companies of the Standard Gas & Electric System have been elected to the board of directors of the Byllesby Engineering & Management Corporation. They will constitute a majority of the board. The action follows the sale by Standard Gas to its operating companies of the stock of Byllesby Engineering & Management, all of which had previously been owned by the holding company. The new directors are: J. F. Owens, Frank R. Phillips, Robert F. Pack, T. B. Wilson, J. P. Pulliam, W. F. Raber, C. M. Brewer and W. N. Clark.

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Associated Simplifies Set-Up

Associated Gas & Electric System has issued several lists of companies once a part of the Associated System which have been merged, dissolved or otherwise disposed of since 1922. In the period ended 1929 these numbered 164 and during the years 1930 to 1932 they numbered 66. Additional eliminations to October 23, 1935, bring the total to 306 companies.

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New Utility Issues

An offering was made to the public last week of a new issue of $20,000,000 first and refunding mortgage 3½ per cent bonds, due in 1960, of the Dayton Power & Light Company, priced at 99½ and accrued interest. Proceeds will be applied toward the payment of all the company's outstanding $18,860,000 first and refunding 5 per cent bonds due in 1941.

Pacific Lighting Corporation recently issued 4½ per cent sinking fund debentures at 100 and accrued interest, a piece of financing involving a total of $10,000,000.

An offering of $37,500,000 of Virginia Electric & Power Company first and refunding mortgage, series A, 4 per cent bonds due in 1955 was made this week. Part of the proceeds will be applied to refunding issues bearing higher interest rates and for additions.

Central Maine Power Company, which recently filed a registration statement with the S.E.C., seeking to issue $29,500,000 of 4½ per cent refunding mortgage bonds, has notified the interested bankers that it does not desire to carry out the financing at this time. President Walter S. Wyman stated that the abandonment of the financing is due solely to the fact that investment market conditions have changed since the financing project was first considered two months ago.

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Power Commission Permits Monongahela Merger

In the first case in which the Federal Power Commission has acted under the new Public Utilities Act, the commission granted last week permission for the Monongahela West Penn Service Company to merge with the Kanawha Traction & Electric Company "in the public interest." Monongahela system stockholders at a meeting held October 11 had approved the reorganization plan calling for the merger with the system of the Kanawha Traction & Electric Company, the Spencer Water & Ice Company and Monongahela Water & Electric Company (ELECTRICAL WORLD, September 28.)

Current Earnings Reports

Operating Companies

	1935	1934
Alabama Power (Year to Aug. 31)		
Gross earnings....	$16,173,327	$15,485,682
Net balance.....	607,415	522,663
Consol. Gas, Elec. Lt. & Pwr. (Baltimore) (Year ended Aug. 31)		
Gross earnings....	30,121,054	28,531,103
Net balance.....	4,918,025	4,662,963
Consumers Power (Year to Aug. 31)		
Gross earnings....	29,272,764	27,932,665
Net balance.....	3,249,247	3,352,034
Duquesne Light (Year ended July 31)		
Gross earnings....	25,585,772	25,071,129
Net balance.....	9,933,479*	10,259,090*
Georgia Power (Year to Aug. 31)		
Gross earnings....	22,831,485	22,204,725
Net balance.....	1,350,997	1,150,359
Kansas City Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings....	15,379,128	14,582,668
Net balance.....	3,477,918*	3,266,385*
New Orleans Public Serv. (Year ended Aug. 31)		
Gross earnings....	15,164,706	14,963,142
Net balance	177,820†	314,522†
Ohio Edison (Year to Aug. 31)		
Gross earnings....	15,616,007	15,023,185
Net balance.....	1,442,467	1,323,573
Penn. Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings....	34,508,700	33,887,417
Net balance.....	4,636,857	5,391,516
Puget Sound Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings....	13,594,723	13,047,302
Net balance.....	1,371,336†	1,507,321†
Tennessee Elec. Pwr. (Year to Aug. 31)		
Gross earnings....	12,821,841	12,268,093
Net balance.....	391,191	442,813
Virginia Elec. & Pwr. (Year ended Aug. 31)		
Gross earnings....	15,222,537	14,988,362
Net balance.....	1,616,112	1,474,277

Holding Companies

	1935	1934
American Pwr. & Lt. & subs. (Year ended Aug. 31)		
Gross earnings....	$80,714,569	$74,685,717
Net balance.....	6,598,741	3,157,080
American Wtr. Wks. & Elec. & subs. (Year ended Aug. 31)		
Gross earnings....	46,795,925	45,249,182
Net balance.....	1,729,377	2,029,428
Commonwealth & Southern & subs. (Year ended Aug. 31)		
Gross earnings....	118,178,614	113,566,452
Net balance.....	774,427†	744,142†
Electric Pwr. & Lt. & subs. (Year ended Aug. 31)		
Gross earnings....	76,185,764	72,343,935
Net balance.....	158,487†	480,109†
Engineers Pub. Serv. & subs. (Year to Aug. 31)		
Gross earnings....	45,159,259	43,712,715
Net balance.....	1,268,472†	1,435,818†
Northern States Pwr. (Del.) & subs. (Year ended Aug. 31)		
Gross earnings....	32,619,850	31,797,817
Net balance.....	5,065,109*	5,189,505*
National Pwr. & Lt. & subs. (Year ended Aug. 31)		
Gross earnings....	71,842,742	71,115,104
Net balance.....	6,079,070	6,787,458
Philadelphia Co. & subs (Year ended July 31)		
Gross earnings....	47,245,352	47,448,537
Net balance.....	7,167,123*	8,025,850*
Public Service Corp. of N. J. & subs. (Year ended Aug. 31)		
Gross earnings....	119,761,151	119,528,613
Net balance.....	24,326,654*	25,342,742*

*Available for all dividends. †Deficit.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

MANUFACTURING AND MARKETS

Current Business Outlook Encouraging

Favorable

Utility output exceeds all records.
Power station negotiations increase.
Transformers, poles, meters in demand.
Merchandise products gain in sales.
National industrials continue active.
Credit pressure mounts in banks.

Unfavorable

Utilities continue postponement policies.
Fear of inflation creates uncertainty.
Banks still hesitate on term loans.
Federal spending continues on deficit basis.
Budget making slows up sales negotiations.
Implementation of new legislation slow.

"Better Sight" Movement to Be Promoted by Radio

The Better Light-Better Sight movement, which has proved so successful in promoting better vision through improved illumination, is being even more widely brought to public attention by the spoken word through the medium of a new radio series presented under the co-operative sponsorship of local electric service companies throughout the country and the General Electric Company. The first broadcast was on October 20.

Entitled "John Clemens, the Melody Master," the radio series is designed to have a broad public appeal and to embody the mood of the family and home. It will be broadcast over WEAF and stations of the NBC red network every Sunday from 11 to 11:30 p. m., Eastern standard time, originating in the NBC studios in Radio City.

Vocal and instrumental selections of the enduring music that everybody loves will be presented against a script background written by Homer Croy, one of the foremost delineators of American life.

The programs will open with a short announcement, by the local announcer at each station, of the sponsorship by General Electric and by the local electric company. A brief educational talk on Better Sight will be given at the middle of the broadcast. At its close the program will be cut back to the announcer at each station for a 90-second local commercial announcement designed to tie-in with the general Better Sight movement.

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Department Store as Channel for Refrigeration Sales

"The department store will continue to be one of the most important channels of distribution in 1936 for the electric refrigerator," predicts Vern C. Divine, newly appointed department store supervisor of household refrigeration sales for the Westinghouse Electric & Manufacturing Company.

Mr. Divine bases his prediction on two points, namely, the importance department stores have had in the past as distributing outlets and the increased public acceptance the electric refrigerator has gained. As the popularity of the electric refrigerator ascends in the public acceptance, it becomes increasingly important as a merchandising item to the department store, Mr. Divine explains. An increase of 47 per cent in department store sales for the first seven months of this year over the first seven months of 1934 for Westinghouse refrigerators was also reported by Mr. Divine in citing the important place this outlet is making for itself.

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Canada Heads Export Market

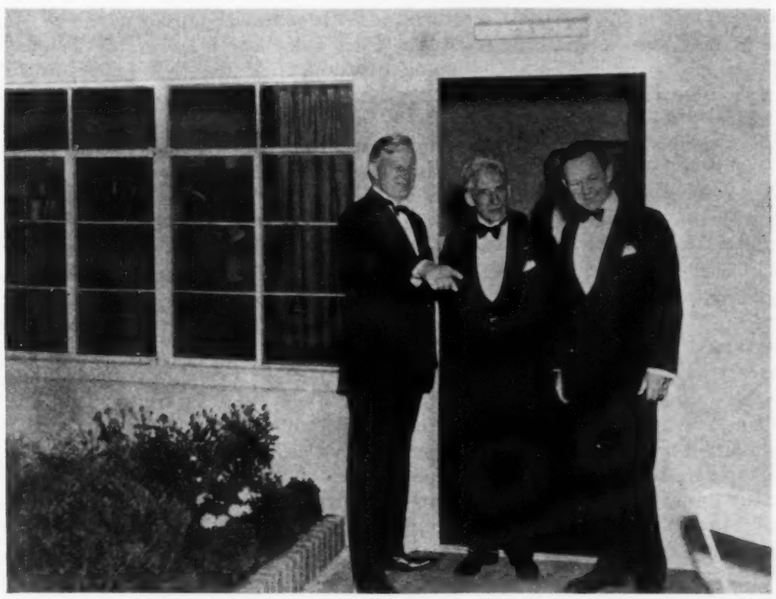
Exports of electrical goods during August were valued at $7,237,039, according to an advance report issued by the Electrical Division of the Department of Commerce. Leading destinations were: Canada, $842,061; United Kingdom, $685,235; South Africa, $541,986; Brazil, $361,995; Mexico, $352,959; British India, $346,109; Soviet Russia, $282,195; Colombia, $272,770; Australia, $270,061; Argentina, $255,194; France, $234,363.

•

G.E. "Future House" Opened

America's most inexpensive modern small house, the result of many years of study by architects, engineers and builders, was officially opened in Radio City's Gardens of the Nations in New York, October 1. Named Future House by the sponsors, the home demonstrates throughout the co-ordinated planning of a new decade of scientific housing, and its opening to the public marked the exhibition of more than 500 "New American" demonstration homes constructed in key locations throughout the country as part of a program inaugurated months ago by the General Electric Company.

Future House offers all-around air conditioning, all-electric kitchen, controlled central heating, a prefabricated panel bathroom developed by the American Radiator Company, and other comforts and conveniences previously restricted to high-priced groups.



Shown at the entrance to the New American Future House opened at Rockefeller Center on October 1 are (left to right): Jay Downer, Rockefeller Center director; Gerard Swope, president, and T. K. Quinn, vice-president, General Electric Company.

1935 Electrical Code Approved by A.S.A.

The new 1935 edition of the National Electrical Code has been approved by the American Standards Association and is designated as A.S.A. Project C1. The code covers: "Requirements for the installation of electric wiring and equipment for light, heat and power as they affect the fire hazard, and for signaling so far as they may be involved in such hazard. The code also includes equipments affecting the life hazard in numerous applications and uses."

While the 1935 edition includes many changes from the text of that for 1933, it is reasonably accurate to say that there are none of major importance. However, proposals to extend the use of non-insulated grounded service conductors to circuits within premises were thoroughly debated this year. The outcome was consent to a provision in Section 513 permitting the use of an approved cable assembly for wiring a special circuit supplying a range only, the cable to have the grounded conductor insulated only by insulation and fibrous coverings of the underground conductors plus the flame- and moisture-proofed fibrous coverings of the cable assembly.

•

Rocky Mountain Association Plans Electrical Jubilee

As the culminating effort in its 1935 business-building program, and as a curtain-raiser for its fifth successful "Give-Something-Electrical-for-Christmas" campaign, the Rocky Mountain Electrical Association has joined with the Edison Electric Institute to promote Electrical Housewares Week, a national project. The activity, sponsored by the institute and the National Electrical Manufacturers' Association, is scheduled for December 2 to 7.

The combination of Electrical Housewares Week and the Christmas merchandising campaign, which will be merged one with the other, is expected to usher in the greatest holiday trade period ever experienced by the utilities and electrical appliance dealers of Colorado, New Mexico and Wyoming. In Denver, where the greatest activity will be centered, the program will be administered jointly by N.E.M.A. and Electrical League.

Plans are under way to enlist the cooperation of more than 4,000 dealers and their staffs and more than 5,000 representatives of the utilities, distributors, manufacturers and other interests. Supplementing the $600 in prize money offered by the Edison Institute for the best window and interior displays in the nation, the association will award cash and other prizes in every town where three or more dealers enter either the national contest, a regional contest now being arranged, or both. Moreover, various company members of the association also will contribute prizes.

The activity will be known as the Electrical Jubilee. The program, while a culminating activity for 1935, also constitutes the spearhead for the 1936 load-building effort.

•

Westinghouse Orders Increase 21 per Cent

Orders received by the Westinghouse Electric & Manufacturing Company in the third quarter of 1935 amounted to $30,497,620, as compared with $25,213,271 for the similar period of 1934, an increase of 21 per cent. Sales billed for the third quarter were $29,723,546, against $23,963,896 for the similar period of 1934, a gain of 24 per cent. Net profit amounted to $2,557,452, comparing with a net loss of $332,062 in the third quarter of 1934.

Comparative figures for the two nine-month periods were as follows:

	Nine Months Ended Sept. 30, 1935	Nine Months Ended Sept. 30, 1934
Orders received	$95,482,535	$79,105,881
Sales billed	92,019,563	69,245,486
Net profit	8,822,640	*363,787

*Net loss

Orders received during the nine-month period were 20.7 per cent higher than in 1934 and billings were 32.9 per cent higher.

•

Gerard Swope Testifies at Patent Hearing

Gerard Swope, president of the General Electric Company, and Dr. Frank B. Jewett, vice-president of the American Telephone & Telegraph Company and president of the Bell Laboratories, testified last week before the patent committee of the House of Representatives that they saw no objection to the registration with the Patent Office of patent pool and cross-licensing agreements. The hearings are being held at the Fifth Avenue Hotel, New York.

Dr. William I. Sirovich, chairman of the committee, announced that the hearing would start with the taking of testimony on "the most important single patent pool in existence, namely, the pool to which the American Telephone & Telegraph, the Radio Corporation of America, Westinghouse and General Electric are parties."

Mr. Swope emphatically denied reports that General Electric had bought up patents to suppress them rather than make changes in the present manufacturing equipment and in order to keep present devices on the market. "In all my experience I never have known of any such thing either with our company or another," he said. "You see, there is always the danger of some one else coming along with either the same device or something better or different."

•

General Electric Reports Profit of $17,205,332

Sales billed by the General Electric Company during the first nine months of 1935 amounted to $149,173,275, compared with $121,735,123 during the corresponding period last year, an increase of 23 per cent, President Gerard Swope announced last week. Profit available for dividends on the common stock for the first nine months of this year was $17,205,332, compared with $11,714,247 for the first nine months of last year. This profit is equivalent to 60 cents a share for the first nine months of 1935 and 41 cents a share for the first nine months of 1934 on 28,845,927 shares outstanding in both periods.

	1935	1934
Net sales billed	$149,173,275	$121,735,123
Less: Costs, expenses and other charges	137,917,594	113,306,954
Net income from sales	$ 11,255,681	$ 8,428,169
Other income, less interest paid and sundry charges	5,949,651	5,217,382
Profit available for dividends	$ 17,205,332	$ 13,645,551
Less: Cash dividends on special stock	.....	1,931,304
Profit available for dividends on common stock (28,845,927.36/100 shares issued)	$ 17,205,332	$ 11,714,247

Orders received during the first nine months of 1935 amounted to $158,943,765, compared with $132,613,543 for the nine months last year, an increase of 20 per cent.

•

N.E.M.A. Elects Officers

After a year of active service to the National Electrical Manufacturers Association, Frank C. Jones, president of the Okonite Company, was re-elected president of the association at the recent annual meeting. B. W. Kerr, president of the Railway & Industrial Engineering Company, and F. W. Magin, president of the Square D Company, were elected vice-presidents, succeeding D. G. Phelps and F. R. Fishback. S. L. Nicholson, C. L. Peirce, Jr., and E. O. Shreve were re-elected vice-presidents. Mr. Kerr is first vice-president, Mr. Nicholson second, Mr. Magin third, Mr. Shreve fourth and Mr. Peirce fifth.

•

Allis-Chalmers Bond Issue

Registration statement has been filed with the Allis-Chalmers Manufacturing Company of Milwaukee for a $15,000,000 issue of ten-year convertible debentures. Proceeds of the issue will be used largely to retire $13,963,000 of 5 per cent gold debentures.

OPERATING PRACTICES

ENGINEERING • CONSTRUCTION • OPERATION • MAINTENANCE

Lineman Safety Belt of Woven Fabric

Far superior to the conventional type of lineman's safety belt is a new type developed in the research laboratory of the Brooklyn Edison Company. Made of woven fabric instead of leather, it incorporates novel features of design that result in greater strength, greater flexibility in use and lighter weight, with no increase in cost.

Fabric belt withstands repeated testing at 1,000 lb.

Corrosion-resistant hardware may be salvaged. Detachable tool belt may be worn "right or left hand." Detachable tool holders to be worn as needed. Displays external signs of deterioration and abuse in time to avoid accidents.

In 1928, following reports of accidents to linemen due to defective safety belts, it was decided to test each belt in service to see whether it was safe for further use. The tests indicated the need for drastic changes and the development of a new type was immediately started.

Leather belts were found to be very variable in strength and length of service, depending on the condition of the hides from which they had been cut and the care they received. Proof testing was not possible, since a tensile test high enough to be of any value permanently injured the leather. Visual inspection meant little, since it is known that external appearance is no criterion of leather quality when new, or of deterioration after usage. Curiously enough, the hardware was conspicuously marked "Tested at 1,500 Pounds," while the leather parts, under the same strains and subject to deterioration, couldn't possibly withstand such testing.

The new fabric belt, however, represents a well-balanced design, in which the component parts are essentially the same strength, and it compares thus with the original leather type:

	Strap	Body Belt	Cushion
Breaking Strength, lb.			
Leather ...	600	250	1,400
Fabric	3,000	1,500	2,500

Values for leather are subject to extreme variation. The values for fabric in the table represent specification requirements; actual test results are considerably higher. Another, and newer, criterion of strength is ability to absorb energy, as in the case of a falling wearer, in which respect the fabric belt is 400 per cent better than the leather belt. The improvement in strength is the result of hundreds of tests, involving methods as well as materials, and the experience of hundreds of belts in service.

•

Saves Time of Meter Tester

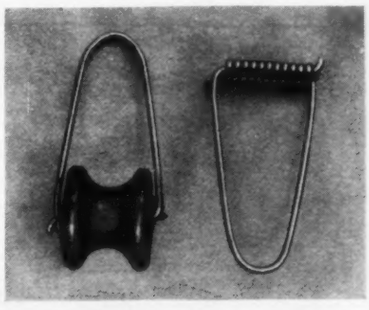
In the meter department of the Los Angeles Bureau of Power and Light meter test tables have been equipped with a simple yet time-saving circuit which maintains an electric soldering iron ready for instant use by the repairman. The circuit for the iron is wired through a double-contact snap switch and a 160-ohm resistor and arranged so that normally the resistor limits the amount of current in the iron to a point where it is just hot enough to work with satisfactorily. For heavy work over a prolonged period the operator throws the switch and places the iron directly across the service voltage.

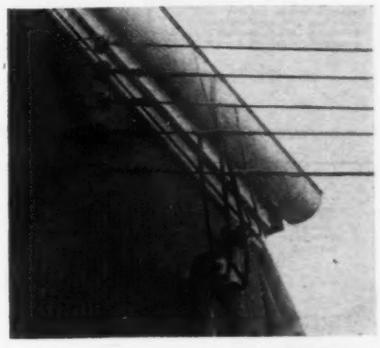
Under normal testing, there may be long periods when the soldering iron is not required. Formerly it was necessary either to wait for the iron to heat up when its use was required, involving wasting of the repairman's time, or to keep the iron on full voltage all the time, which was responsible for limited life of the iron itself. With this new circuit the iron is conveniently available at any time without the risk of excessive heating.

•

Simple Design for Swinging Bracket

Spool-type porcelain insulators hung in wire loops passing through screw eyes are not uncommon means for attachment of service wires to buildings. An improvement in this classic method has been made by Bruce Wells, Louisville Gas & Electric Company, and is now in use on the Louisville distribution system. Instead of the service man looping the insulator and screw eye together with any short piece of wire he happens to have on his truck, he uses a length of medium hard-drawn copper that has been preformed in the shop for this particular





Service attachment simplified

After the screw eye is set the service man assembles the eye, pre-formed loop and insulator in this manner.

purpose. One end of the wire has been wound on a mandrel to form a helix of a diameter just about large enough to fill the hole in the insulator. The remaining length of the wire is then formed into a long loop so that the free end may be passed through the helix, bent into a holding turn and cut off.

•

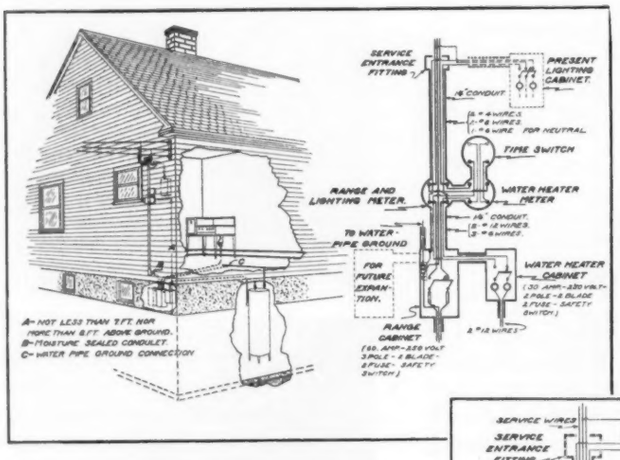
Standardized New Sequence Metering

By E. F. ANDERSON
Portland General Electric Company, Portland, Ore.

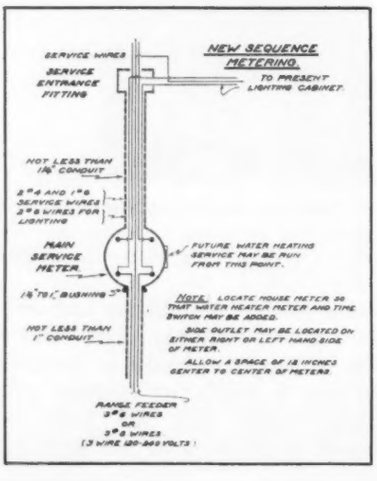
In common with other Northwest utilities, the Portland General Electric Company, Portland, Ore., is aggressively promoting electric ranges, and offering off-peak water heating on an 8-mill rate, the latter service being separately metered and controlled by a time switch. New sequence metering is being applied as rapidly as conditions permit. Standards have been adapted which are applicable to both old and new installations.

The method by which the existing lighting service of an old home has been converted to the new sequence with outdoor meters at the time a range and water-heating installation was made is shown in Figs. 1 and 2. It will be noted that the service wires enter the metal-clad installation at the service fitting, are carried to the meter, where the hot legs are tapped from the service side, and led back through the metal-clad installation to the existing lighting cabinet, the range service also being taken from that point, but the water-heating lead being taken off from the line side of the meter to a separate meter for the water-heating service. The water-heater time switch is arranged for mounting in the socket-type base similar to that used for the watt-hour meter and the assembly provides a neat-appearing, completely metal-clad, tamperproof installation which meets all the requirements of the modern electrified home.

Where only a new range service is to be installed the connections are as shown in Fig. 2; those to the existing lighting cabinet being made as previously described. Provision for adding the water-heater meter and time switch is made by the opening in the base of the main service meter mounting.


SERVICE ENTRANCE FITTING
PRESENT LIGHTING CABINET.
TIME SWITCH
RANGE AND LIGHTING METER.
WATER HEATER METER.
TO WATER-PIPE GROUND
FOR FUTURE EXAMINATION.
WATER HEATER CABINET
RANGE CABINET
A- NOT LESS THAN 7 FT. NOR MORE THAN 8 FT. ABOVE GROUND.
B- MOISTURE SEALED CONDUIT.
C- WATER PIPE GROUND CONNECTION

Figs. 1 and 2—Converting existing lighting service to new meter sequence serving range and water heater


SERVICE WIRES
SERVICE ENTRANCE FITTING
NEW SEQUENCE METERING.
TO PRESENT LIGHTING CABINET.
NOT LESS THAN 1½" CONDUIT
MAIN SERVICE METER.
FUTURE WATER HEATING SERVICE MAY BE RUN FROM THIS POINT.
Note. LOCATE HOUSE METER SO THAT WATER HEATER METER AND TIME SWITCH MAY BE ADDED.
SIDE OUTLET MAY BE LOCATED ON EITHER RIGHT OR LEFT HAND SIDE OF METER.
ALLOW A SPACE OF 18 INCHES CENTER TO CENTER OF METERS.
RANGE FEEDER

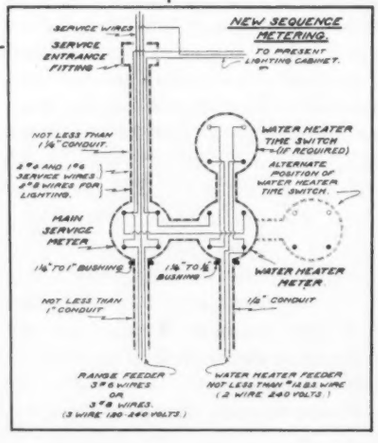


Fig. 3—For new sequence metering where only new range service is added

Chemical Process Prevents Corrosion

By L. F. HIRSH
Chemical Engineer
Philadelphia Rust-Proof Company

The Public Service Company of New Jersey has cut maintenance costs and prevented corrosion of transformer radiator coils and other equipment by applying a rust-proof chemical coating to exposed surfaces. New transformers ordered five years ago for its Roseland generating station had their surfaces chemically converted to insoluble iron phosphate salts by a process known as "Parkerizing." This equipment has not required repainting since installation. Transformers purchased at the same time by another large utility company have been repainted yearly at a cost of $4,000 to $5,000, and are still rusty.

If transformer fins and coils are removed a few at a time this chemical coating can be applied without shutting down the equipment. Before treating, old paint and rust are removed by sand blasting and alkali cleaning. The parts to be coated are then treated in the chemical bath. After treatment a coat of primer, such as DuPont "Dulux" radiator primer, should be applied and a final coat of some durable insoluble paint added. Experience has proved that coating applied in this manner prevents rust and preserves the surface of equipment for five years or more without attention.

The Philadelphia Electric Company uses this treatment to protect traveling water screens operating almost continuously in and out of water. Transformer cases and other equipment placed in manholes and vaults subject to immersion in water from rain and underground seepage have been successfully protected in this manner. In fact, underground transformer cases which are rusted are being salvaged for the Philadelphia Electric Company at a cost of about $10 for the 50- to 70-kva. sizes.

Cost of applying the protective chemical coating to transformer fins and cooling coils is approximately $30 per fin for 40,000-kva. transformers with 25 fins. This cost is far below the cost of repainting transformers yearly for four or five years, at the end of which time equipment may still be rusty.

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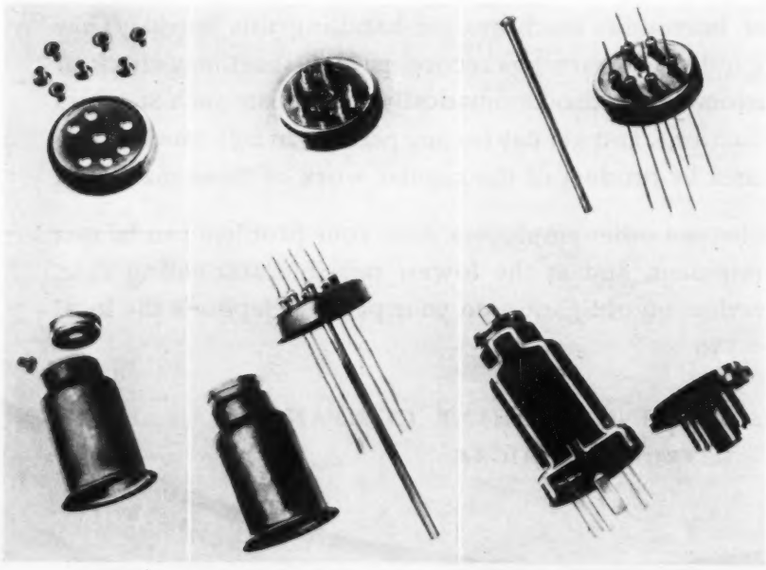
Welding Essential for New Radio Tubes

Without resistance welding it is doubtful if the all-metal radio tube would be practical from either a mechanical or production standpoint, reports the Thomson-Gibb Electric Welding Company. It takes the precise control of welding variables provided by a modern welding press to handle the special alloy eyelet seals, the vacuum-tight projection weld of the shell to the header and the "welding-off" of the exhaust tube. Because of the speed and efficiency of the automatic welding equipment used all metal-tube production compares favorably with the output of glass-tube machines.

Resistance welding enters the picture right at the start and plays an important part in almost every step. The special alloy eyelets are welded to the nickel-plated header cup by a No. 2 press. After the terminal wires are inserted and brazed to the eyelets the exhaust tube is welded to the center of the cap by a Thomson-Gibb No. 1 press. The first operation on the shell unit joins an eyelet to the inside of the top, followed by a cup for the top terminal, which is joined to the outside. Both welds are made on a No. 1 press. The next resistance weld, made on a No. 2 press, joins the completed shell to the header. After the shell is exhausted the exhaust tube is pinched and welded-off with a gun welder. Addition of a top terminal and a molded base complete the tube.

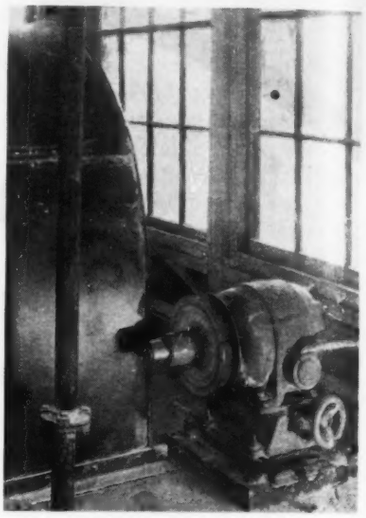
Perhaps the loudest and longest objection to all-metal tubes concerned the amount of welded area. Counting all the lead-in eyelets and the weld between the shell and the header, there are about $4\frac{1}{2}$ in. of vacuum-tight weld on a typical seven-prong tube. Critics pointed out that compared to a glass tube of the same type, which has less than $\frac{1}{2}$ in. of contact at the lead-in wires, the metal tube multiplied the chances of leakage many times. Now that tubes are actually in production, experience shows that when the proper welding equipment is used the danger of faulty welds is extremely remote.



Parts of all-metal radio tube assembled by welding

(a, b, c) Header and eyelets assembled in one operation by resistance welding using work locator and dial feed. Glass beads brazed into eyelets insulate and seal terminals. (d, e, f) Elements of shell assembly joined and sealed by resistance welding. Exhaust tube pinch-off made with gun welder.

Variable-Speed Fan Hastens Candy Drying

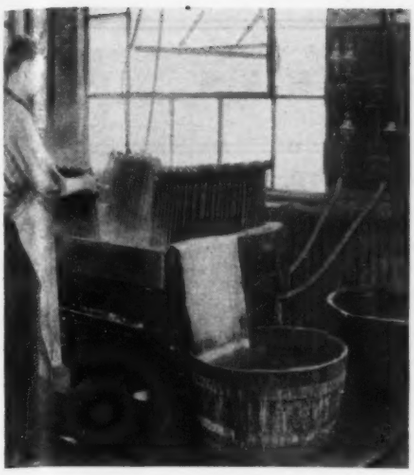


By installing a variable-speed fan drive in the air supply to candy wafer driers Edgar P. Lewis & Sons, Inc., Malden, Mass., obtain quicker drying and a saving in the use of steam for heating material in process. The fan is driven by a 3-hp., 550-volt U. S. Electrical Manufacturing Company induction motor equipped with a variable-diameter adjustable V-belt pulley which gives a speed range of from 600 to 200 r.p.m. The fan was formerly driven by belt from a 3-hp., 1,200-r.p.m., constant-speed motor. A stepless adjustment of speed enables the proper air supply to be fed to the drier apparatus for whatever type of wafer is being manufactured.

•

Spoilage Prevented by Hot-Metal Dip

In manufacturing cooling coils for electric refrigerators, the fins are soldered and a finish given by dipping each coil in a bath of solder at the plant of the Bush Manufacturing Company, Hartford, Conn. Formerly these baths were heated by fuel and it was virtually impossible to maintain a constant temperature for this work. As a



Electric heaters in solder bath maintain uniform temperature

result the solder frequently became too hot and oxidized; this led to the loss of thousands of pounds a year from skimming off and throwing away the top. The fins would also be annealed from the excessive heat, causing rejections. Electric heating units were installed in the bath with automatic control holding the temperature within a very few degrees. As a result there was little oxidation of the solder and the undesired annealing of fins gave no more concern. Uniform thickness of solder is now deposited at each dipping.

The cost of electric operation is trifling in comparison with the value of maintaining quality production with spoilage eliminated.

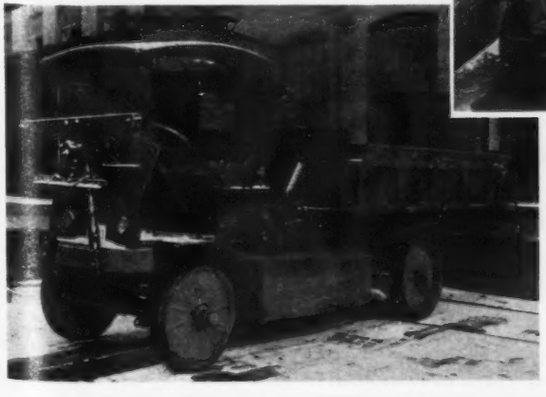
•

Mechanized Transport Serves Carpet Plant

Electrical industrial and road trucks play a major part in handling materials in process and finished products at the Thompsonville, Conn., factory of the Bigelow-Sanford Company, an establishment covering 24 acres of land and having 43 acres of floor space. According to E. L. Ridley, plant engineer, and Eugene Martin, chief electrician of these works, the service rendered by the truck fleet illustrates the value of motorized transport under somewhat unusual conditions. Certain of the haulage operations must be kept within the plant buildings, and these are connected by ramps, which in some cases involve long runs and stiff grades.

In one instance a fork type of industrial truck of 4,000 lb. capacity and equipped with an extra large "Exide" battery hauls a 1,200 to 1,500-lb. load of wet wool from the wash house to the dyehouse. The length of the run is 400 ft., and of this 100 ft. is up a 12 per cent grade. This unit is in operation continuously through the day's work and its superiority over other means of shifting this load is striking, as only one operator is required to handle the unit. One of the industrial trucks owned by the company paid for itself within three months when temporarily detached from regular production to aid in shifting heavy machine units to new locations, being utilized as a tractor in combination with a dolly which carried a portion of the machine load. The plant has six battery-charging stations (on first and second floors) to save truck mileage waste.

Prevents 12 per cent grade from becoming a "bottleneck"



Clears mill yard of snow in addition to hauling raw material

The road trucks haul warp, jute, cotton and wool to the various weave rooms from storage houses and perform other miscellaneous tasks, such as hauling tanks of chemicals and transporting waste to a dump 2,500 ft. distant. One of these trucks, a Walker 7,000-lb. outfit with Exide battery, is equipped with an outrigger to carry a snowplow. The truck is used after every snowfall to clear 93,200 sq.ft. of roadway, parking space and other yard area, including 960 ft. of railroad siding.

•

Sand Fill Pumped Electrically

Main pipe line and substation

Electric power supplied to two 300-hp. motors was used in pumping 214,000 tons of sand fill through 5,900 ft. of 10-in. pipe for three bridge and viaduct approaches in Platte and Wyandotte counties, near Kansas City, Mo., last year. Approximately 620,000 kw.-hr. was consumed by these motors during the five months that the job was in progress.

This job, undertaken by the Stewart Sand & Material Company, required the placing of sand fills, to conform to government specifications without damage to adjoining lands. These fills, one at the regional bridge and two at the viaduct over the Union Pacific Railroad tracks, were made approximately 40 ft. in height.

Primary energy at 33,000 volts was supplied from the Kansas City Power & Light Company lines to a 600-kva. substation, where it was "stepped down" and distributed to the two pump motors. One of the 300-hp. motors was installed on a pump barge in the Missouri River at the point where the sand was to be removed from the river bed. The second motor was used to drive the booster pump near the center of the pipe line.

Electromagnet Has 60-Ton Pull

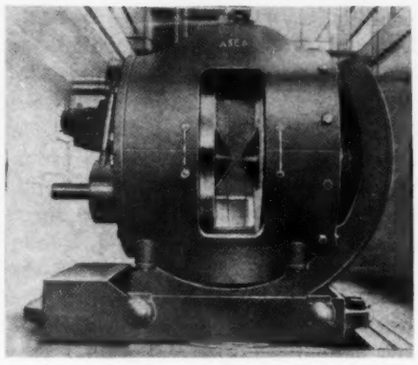
A huge electromagnet, said to have a force of attraction between pole tips of 60 tons, has been constructed for the experimental laboratory of the University of Uppsala, Sweden, by the Swedish General Electric Company (ASEA). Second in size and weight only to the magnet belonging to the French Academie des Sciences, this new magnet is reported to have an attractive force somewhat greater than the French magnet, though its weight is 60 per cent less.

High gap flux density is obtained by use of a conical core having an apex angle of nearly 90 deg. and a base area 3.7 times that of the pole pieces. This reduction in area of the core where the pole piece is attached increases the flux density about 23 per cent.

Fully assembled, the magnet weighs 37 tons, of which 33 tons is accounted for by the magnet proper, consisting of a magnet coil, magnet housing, end blocks, pole cores, center cores and pole pieces.

The cylindrical type magnet housing, as assembled, has an outside diameter of 67 in., an inside diameter of 60 in. and a length of about 7 ft. Completely assembled a pole block with cores and pole pieces weighs about 5 tons.

Movement of the magnet is possible with the aid of a roller frame which allows the axis of the magnet to be turned into a horizontal or vertical position as well as rotated about a vertical axis.



Huge Swedish magnet has high effectiveness

The magnet coils are built up of rectangular, hollow, water-cooled copper conductors having an effective area of about 0.65 sq.in. and at the permissible current capacity of 1,667 amp. have a magnetomotive force of 500,000 amp. turns. The continuous rating of the coils is 140 kw.

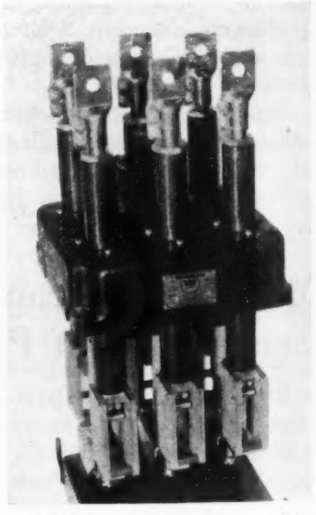
Fitted into either end of the cylinder are core blocks, one of which can be moved axially to permit adjustment of the distance between magnet coils. On these coil blocks are mounted the conical pole cores of wrought iron. These cores are 44 in. in diameter at the base and 23 in. in diameter at the top. Through the core is a hole carrying movable center cores, to which the conical pole pieces and pole tips are attached.

Deïon Interruption Industrial Breakers

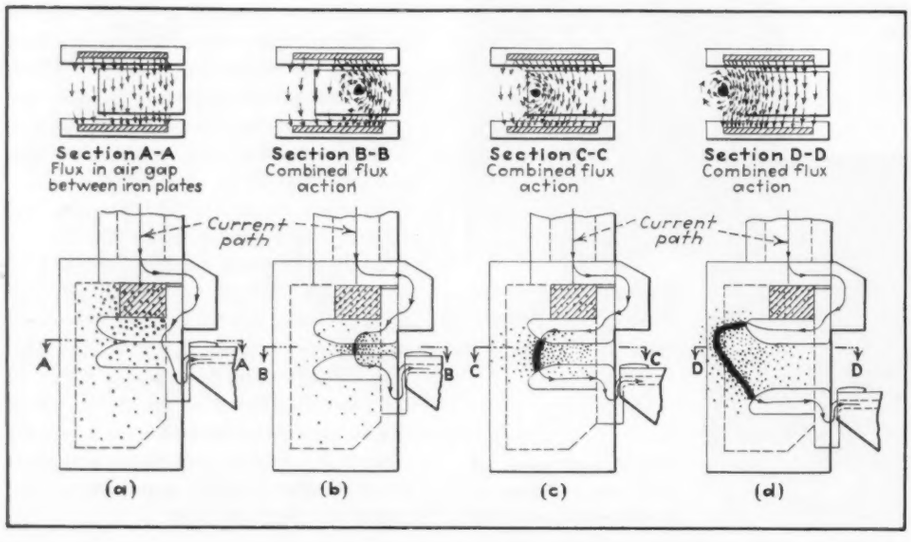
By W. R. SWOISH
Circuit Breaker Department,
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Miniature "Deïon" grids like those used on large oil breakers prove too bulky for application to smaller 25,000 to 50,000-kva. (15 to 2.5-kv., 600 to 2,000-amp.) oil circuit breakers. Newly developed arc extinguishers for such breakers quench the arc in one-fourth to one-third the opening stroke with an actual arcing time from ½ to 1½ cycles maximum for 60-cycle power; these are less than half the usual values. Reduced arcing time and lower arc energy materially reduce maintenance.

The interrupter consists essentially



25,000-kva. industrial oil circuit breaker equipped with Deïon interrupters



How the Deïon interrupter works

(a) Arcing contacts closed, main contacts opening.

(b) Arcing contacts part, arc is formed.

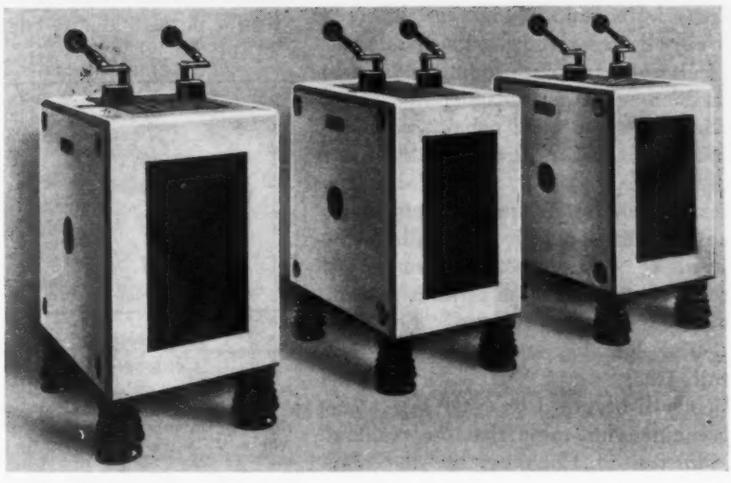
(c) Magnetic force beginning to act on arc. Arc moving toward contact tips.

(d) Magnetic force drives and lengthens arc considerably more than represented by contact separation. This increases restriking voltage necessary for reignition along arc path. Driving force and deionization increase until arc is extinguished.

IN KANSAS CITY, MISSOURI

AS IN MANY OTHER METROPOLITAN AREAS

PRIMARY DISTRIBUTION SYSTEMS ARE PROTECTED BY



MURRAY LOW LOSS CURRENT LIMITING REACTORS

Murray Low Loss Reactors provide the right kind of protection—for they convert reactor losses into reactor savings.

You know how much short circuit protection you should have. We know and installations prove that Murray Reactors provide highest efficiencies and smallest energy losses.

When in need of reactor protection send us your inquiries. Efficiencies guaranteed.

METROPOLITAN DEVICE CORPORATION, BROOKLYN, N. Y.

SOME TYPICAL MURRAY REACTOR INSTALLATIONS

Kansas City Power & Light Co.,
Tennessee Power Co.
United Electric Lighting Co.,
El Paso Electric Co.
Public Service of No. Ill.
City of Seattle

Houston Power & Lighting Co.,
Brooklyn Edison Co.,
Consolidated Gas, Elec. Lt. & Pwr. Co.,
Edison Elec. Illuminating Co. of Boston
New York & Queens Elec. Lt. & Pwr. Co.,
United Electric Light & Power Co.

Utica Gas & Electric Co.,
City of Detroit
Gary Heat, Light & Water Co.
Union Electric Light & Pwr. Co.
Southern Wisconsin Power Co.
Syracuse Lighting Co.

of two fiber-insulated iron plates, one on each side of the arcing contacts and connected at the top by a small iron bar (see sketches). As the contacts part the magnetically controlled arc is moved outward away from the arcing contacts. This driving force on the arc lengthens it considerably more than is represented by the contact separation. This driving action also forces the arc continually against a wall of cool oil, thereby increasing the restriking voltage necessary for reignition along the arc path. The driving force increases until the arc is extinguished, which is in 25 to 35 per cent of the opening stroke.

•

High Frequency for Cobalt Steel Melt

High-frequency induction furnaces are used exclusively by the Bethlehem Steel Company in producing "Cobaflux," a permanent magnet steel, containing 38 per cent cobalt, which is introduced in the furnace in the form of metallic cobalt. The alloy is formed into 4½-in. square ingots which are hammer-cogged into billets instead of being broken down under rolls, after which each billet is ground on all sides and pickled. For conversion into bar stock the billets are rolled hot.

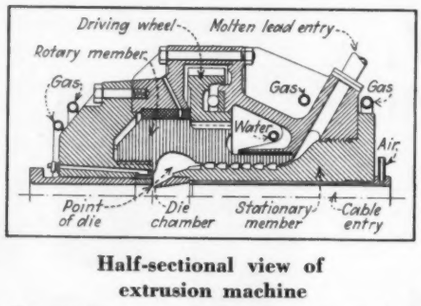
It will be noted by referring to the accompanying table that the residual induction of Cobaflux, as this high content cobalt steel is called, is high, and its energy product is about five times that of plain carbon magnet steel. This factor promotes economy of space in exacting applications, such as instruments, airplane equipment, magnetos, phonograph pickup and the like.

Castings of the 38 per cent cobalt magnet steel are also produced by a recently developed technique.

Extruded Sheath Made Continuous

Based on the principle of the screw extruder is a machine for the continuous production of lead cable sheath, developed by Dr. Dunsheath, chief engineer of W. T. Henley's Telegraph Works Company, London. With this machine, believed to be the first of its kind, a continuous, uninterrupted supply of lead at a uniform temperature is delivered at the extrusion point. Discontinuous operation of the reciprocating type of lead press extruder necessitates the withdrawal of the ram for refilling at the end of each charge.

Molten lead entering the machine from the melting pot passes into a screw-threaded space between a rotating member and a fixed, threaded member and is passed along to a die chamber, from which it is forced between a point and die, emerging as a solid tube. Rigid support of the "point" relative to the die and elimination of springing is said to have resulted in production of a tube of uniform and accurate section.



Half-sectional view of extrusion machine

Hot molten lead entering through pipe at right passes into threaded space between rotating member and stationary member, where it is cooled externally. The rotating member forces the lead, now in a semi-solid state, to the left into the die chamber and out between the die and point as a solid tube.

In the course of development of the machine pipes of different diameter, cable sheaths of different kinds—dry core, impregnated paper and rubber—and special sections have been successfully produced. In addition to extrusion of plain lead, all of the common alloys, such as lead-antimony, lead-tin, etc., have been used.

Lead extrusion machine for continuous production of cable sheath

•

Fine Mesh Screens Made Electrically

Smooth surface metallic screens of any mesh up to 400 holes per linear inch, made from any platable metal with nearly any desired thickness and hole size, are now being produced electrolytically by the Electrolytic Products Corporation, New York City. The finished screens are variously used in the making of photo-engravings. Their acoustic properties have made them suitable for telephone and broadcast transmitters and pick-up devices to aid the deaf.

Produced by electrolytic deposition of metal on a cylindrical matrix, from which the perforated product is stripped continuously, the screen appears as a smooth metal sheet with minute perforations. Thickness of the sheets can be varied from a fraction of a thousandth of an inch to several thousandths, while the hole size may be varied from a maximum diameter of 75 per cent of the center-to-center distance between holes, for any mesh, to almost any minimum diameter desired. Normally, the screens are made with circular holes; however, it is possible to control the shape of the hole to a broad extent.

Table of Magnet Steels—Analyses and Properties

Brand	C	Mn	Cr	W	Co	Residual Induction	Coercive Force	Energy Product	Treatment, Deg. F.
Carbon.....	0.60	0.80	....	....	....	9,000	35	180,000	1,525 water
Chrome.....	0.60	0.40	1.00	....	....	9,000	45	200,000	1,525 water*
Chrome, 2%.....	0.90	0.40	2.00	....	....	9,000	52	230,000	1,450 water*
Chrome, 4%.....	0.90	0.40	4.00	....	....	9,500	60	270,000	1,525 oil
Tungsten.....	0.60	0.40	....	6.00	....	10,500	60	300,000	1,560 water
Cobalt, 29%.....	0.90	0.40	4.00	8.00	20.0	9,500	135	630,000	1,740 oil
Cobalt, 38%.....	0.90	0.40	5.00	4.00	38.0	9,500	235	900,000	1,740 oil

*Sometimes oil quenched.

Building Refrigerator Load

A Review of the Experience of Eighteen Power Companies Outstandingly Successful Last Year—Local Conditions, How They Sell Refrigerators and the Results

NOBODY can say that the idea of electric refrigeration has not been sold to the American home. They may not all be using refrigerators, but the idea has gone over in a big way. More than 7,000,000 have been sold to the 20,000,000 wired homes in the country. Not only do the rich and the middle-size purses enjoy it, but the poor long for this luxury—and buy it, too. For the small chest-type refrigerator is being both rented and sold most successfully to families that use less than 30 kw.-hr. a month. It is the hope of the industry for converting the minimum bill consumer to a basis that pays a profit.

It would seem, therefore, that the power companies are thoroughly awake to the value of refrigeration as a load. Great things have been done with it. For the fact that the total send-out of the industry has recovered from its loss of industrial business due to the depression, until today's combined load curve stands above the winter peak of 1929, is largely due to the industrious selling of refrigerators through the past five years. But the accompanying tabulation raises some interesting doubts. It makes you wonder whether, after all, some companies have really sensed the measure of the opportunity which domestic refrigeration affords.

Last March 2 ELECTRICAL WORLD published an analysis of the merchandising activities of more than 100 power companies during the year 1934. Total sales of the major appliances were compared with the number sold in 1933. And again on August 3 a similar comparison was published for the first six months of this year contrasted with last. The eighteen companies listed in the accompanying tables were selected from the twenty top companies in this analysis for closer study of the methods they had used in selling refrigeration load, and the local conditions under which they worked.

These eighteen systems operate in communities of varying size. The total number of domestic consumers runs from 761,613 to 52,715. There is a similar contrast in the extent to which domestic load has been developed by these companies. The average total domestic consumption runs from highs of 888, 871 and 774 in the

Eighteen Power Companies Sell Refrigerators This Way

A detail comparison of local conditions, methods and results—Experience of a group of companies which have led in load building in the past eighteen months

TABLE I

Company	Total Domestic Consumers Dec. 31, 1934	Av. Total Dom. Consumption June 30, 1935	Av. Revenue from Dom. Cons. 1934	Av. Cost per Kw.-Hr. to Dom. Customer-Cents	Av. Sales of Appl. per Cons. 1934	Present Sat. of Electric Refrig. %	Refrig. Sat. Among Co. Employees. %	Present Dom. Refrig. Rates Aver.-Cents	Total Refrigerators Sold by Company						Total Refrig. Sold By Dealers—Est.			% of Dealer Sales for 18 Months
									6 Mos. 1935	1934	1933	1932	1931	1930	6 Mos. 1935	1934	1933	
A	764,613	766	$33.69	4.40	$4.46	31	.....	4.4	3,606	5,609	5,588	3,970	4,686	4,307	.....	.....	.....	.....
B	713,621	511	34.42	6.74	3.47	30	.....	3.5	2,638	3,526	3,837	2,983	2,933	3,158	.....	32,000	20,000	.....
C	533,123	675	34.30	5.08	3.75	38	60	3.7	2,459	4,442	4,555	2,791	4,162	4,129	32,000	38,514	42,567	91
D	316,008	626	35.48	5.67	3.09	.....	.....	4.0	1,336	2,323	1,806	2,199	1,969	1,615	12,500	18,000	23,000	89
E	300,690	609	33.96	5.58	2.98	23	40	3.3	3,205	2,194	2,475	2,248	2,883	2,981	12,200	10,738	8,525	81
F	295,793	530	35.75	6.75	5.09	23	.....	3.5	2,193	3,091	3,066	3,238	3,493	3,230	6,096	7,500	6,209	72
G	278,357	665	27.97	4.21	6.10	.....	.....	4.0	3,900	4,187	3,002	2,176	1,788	2,005	.....	.....	.....	.....
H	232,403	643	37.99	5.91	3.37	39	.....	4.0	1,531	1,808	1,318	882	1,522	1,022	.....	.....	.....	.....
I	155,781	664	31.21	4.70	8.00	20	70	3.4	2,391	3,023	2,493	1,248	1,261	765	1,500	2,000	1,500	39
J	147,371	704	33.60	4.77	7.95	24	.....	3.0	1,330	2,336	1,927	1,603	1,807	2,184	.....	10,000	8,000	.....
K	126,665	687	40.95	5.96	7.65	35	[C]65	4.0	1,840	2,349	2,644	2,047	2,256	1,863	2,500	1,800	2,000	51
L	120,033	888	35.53	4.00	20.40	50	.....	3.4	[D]4,719	10,428	3,619	1,952	3,417	4,145	4,800	10,572	4,661	51
M	94,271	774	31.96	4.13	19.35	32	.....	3.0	4,551	7,832	1,600	1,242	1,494	2,302	6,193	6,000	3,500	50
N	93,000	732	18.00	2.46	.....	68	75	3.0	888	1,803	1,060	437	358	434	8,880	18,000	10,000	90
O	91,283	620	42.40	6.84	4.90	50	80	6.0	966	2,150	2,122	1,744	1,824	1,595	800	1,434	1,414	42
P	75,416	871	33.44	3.84	15.20	27	.....	2.5	4,315	4,254	2,385	1,081	1,381	1,620	5,800	3,065	1,160	51
Q	67,831	647	38.26	5.91	17.15	40	[C]92	4.0	2,956	3,123	2,243	1,437	2,051	2,108	2,000	800	600	32
R	52,715	680	40.00	5.89	15.75	33	60	.....	2,405	2,148	2,072	.....	.....	.....	2,995	1,200	1,000	48
Total	3,458,974	[A]683	[A]34.38	[B]5.03	[A]8.75	.....	.....	.....	47,229	66,626	47,812	33,278	39,285	39,463	98,264	161,623	134,136	.....

[A]Straight line average. [B]Weighted average. [C]Heads of families. [D]Also rented 437 refrigerators.

TABLE II

Company	No. Selling Refrigerators Average 1934		How do you set up territory and quota for refrigerator salesmen	Compensation Paid to Refrigerator Salesmen	Do same salesmen sell other appliances	Does Co. Finance Time Sales	Maximum Time Given
	Salesmen	Service Women					
A	100	4	Restricted territories, definite quota based on district	Straight com. 10%. Supervisors' salary plus 1% on sales of their men	No	Yes	35 months
B	84	12	Open territory—8,500 domestic customers per man—Average quota 60 units per man	Com. 12% on sales, with guaranteed income of $65.20 a month	Yes, small appliances at 20% com.	Yes	36 months
C	181	..	Territory and quota based on district and previous sales	Salary and com. aggregating 11% of net sales, plus variable load bonus	Yes	Yes	35 months
D	28	8	Definite territory. Quotas set for districts during campaigns, but not for men	Com. 10% on sales, guarantee $15 a week	Yes, same com.	Yes	36 months
E	85	16	No uniform rule. Quotas vary with conditions each year	Salary $50 a month plus 17% com. on sales over $300 a month	Yes, in outlying divisions	Yes	24 months
F	201	21	Definite territories. Quotas based on territory	Salary $55 a month plus $9.60 per refrigerator under 5 cu.ft. and $13.60 for larger sizes	Yes—same com. plus load com.	Yes	24 months
G	120	..	No definite territory. Quotas only in campaigns	Straight com. 10%. Some cases salary $55 a month plus 6% com. in their territory	Usually not	Indirectly	36 months
H	61	..	Division of quotas set and divided among men	Salary plus com. plus bonus for exceptional work	Yes	Yes	24 months
I	70	6	Supervisor assigns territory and quotas in sales meetings	Straight com. 10% plus bonus for exceeding quota	No	Yes	30 months
J	115	..	General salesmen sell full line in small towns. In cities senior salesmen sell refrigerators	Com. 13% on cash and 25% down-payment sales, 11% on other time-payment sales. Guarantee $50 a month. Bonus to districts	Yes—on com. 16 to 14%	Yes	24 months
K	54	12	Closed territories. Quotas only in campaigns	Salary $60 per mo. plus com. 6% on first $1,000 and 10% on balance plus load-building com. of $3.50 per refrigerator	Yes—same com.—varied load:bonus	Yes	24 months
L	177	..	Based on number of customers and purchasing power of territory	Salary $55 to $65 a month plus com. 6% on cash price plus load bonus $3 per refrigerator	Yes—same com.—varied load bonus	Yes	36 mos. on refrig. alone, 48 months (when pur. in comb. with range and/or water heater)
M	47	12	Protected territories, quotas based on possibilities of territory	Salary $50 a month plus com. 6% on net sales up to $1,200 or 10% above that, plus down-payment bonus 2% max. and load bonus $1 per refrig. during campaigns	Specialists on refrigeration in cities, men in small towns sell full line	Yes	36 mos. single unit, 48 mos. combination sales
N	14	..	Open territories. Alternating floor days. No quotas	Straight commission 10%	Sell radio—com. 10%	Yes	24 months
O	20	..	Divide territory by total meters, mileage and population density. Manufacturers' quotas	Some straight com. 10%—others salary $100 plus com. 5%. Variable load bonus above quota	Yes	Yes	36 months
P	29	14	Men cover average of 1,200 meters	Load com. 10% on com'l refrig. or 5% on dom. sales, plus sales vol. bonus $30 on $600 volume plus $7 per $100 up to $1,400 or above $1,500 vol. $93 bonus plus $8 per $100 excess, also down-payment bonus up to 2%	Yes	Yes	30 months
Q	65	5	Average 1,000 meters per man. Quota breaks down division based on possibilities	Com. 15% on sales with $55 a month drawing account	Yes	Yes	36 months
R	30	3	Senior salesman for 1,100 domestic meters	Salary $45 a month plus bonus $5 for chests, $8 for cabinets under 5 cu.ft. or $10 on larger sizes	Yes	Yes	24 months

Southeast and 766 in the Midwest to 511 and 530 in the Northeast. Average revenue for domestic consumers goes from highs of $42.40 and $40.95 in the Northeast and $40 in the Southeast to lows of $22.97 and $18 in the Midwest. Average rates for domestic service vary all the way from 6.8 and two at 6.7 cents in the Northeast to lows of 4 and 3.8 cents in the Southeast and 2.5 cents in the Midwest. Average annual appliance sales per domestic consumer run from highs of $20.40, $19.35, $15.75 and $15.20 in the Southeast and one company with $17.15 in the Midwest to lows of $3.47 and $3.09 in the Northeast and $3.27 and $2.98 in the Mississippi Valley.

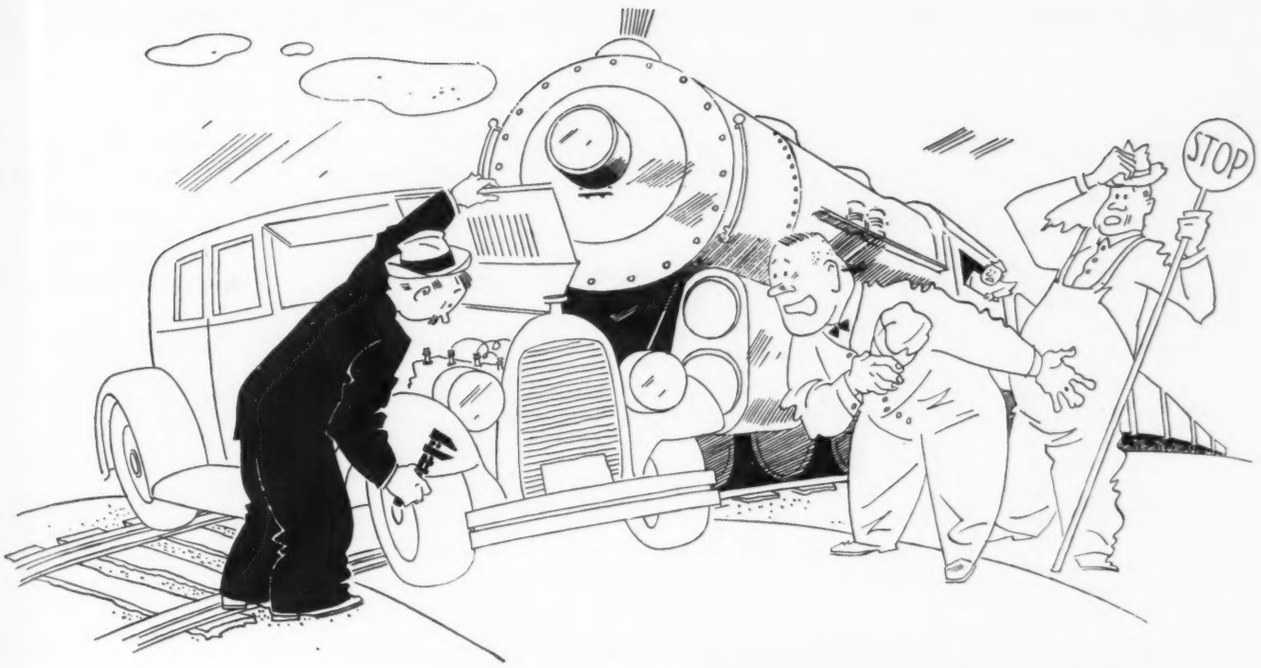
In other words, this group of companies show the usual diversity of local conditions, which indicate how far they have gone in building up domestic revenues. But in all of them rates are low enough to make electric refrigeration marketable, as witness the fact that they stood in the top twenty among the 100-odd systems in the country most actively engaged in merchandising and serving more than 10,000,000 homes, which is over half the nation.

But how far have they actually got along the road to saturation? That tells the story, after all. Well, we have highs of 68 and 40 per cent in the Southeast and 40 in the Midwest and then a gradual dropping off to 27 and 26 per cent in the Northeast and 23 in the Midwest. It is surprising that there should be such a wide difference among these eighteen top companies. Refrigeration has been available to all for the same number of years. Manufacturers' national advertising has reached each city. Dealers sell them in each territory. Yet the six companies with the largest number of domestic consumers to sell stand numbers 3, 7, 6, 15, 10 and 11 in total sales in the last eighteen months. The largest sales were made by the company standing No. 12 in size and the next largest by No. 13 in size.

This, of course, is a reflection of the intensity of the selling. In the four largest cities for which complete dealer totals are reported for the eighteen months dealer sales rate Nos. 1, 2, 4 and 6, which is to be expected, since dealer sales more naturally reflect mass demand than power company totals. Company B would undoubtedly rate high, but dealer totals for the first half of this year were not yet available. The third largest dealer sales were in Company N's territory, which is fourteen in size, and the fifth largest is Company L, which is twelfth in size.

This relation between dealer and power company sales is worth a little study, however. In the mass totals of 100 companies for the past eighteen months power company sales of refrigerators bulked 20 per cent and dealer sales 80 per cent. But look at this comparison of the best sellers. The dealers are selling in some cities 91, 90, 89 and 81 per cent of the total and in others as low as 32, 39, 42 and 48 per cent. It clearly indicates in many cases a low development of dealer sales in that territory, a vital

[*Continued on page 82*]



"May we ask as to YOUR INTENTIONS?"

● Without undue boldness we suggest that Westinghouse Refrigerators be given some well-deserved consideration in the 1936 merchandising plans of public utilities.

For one thing, Westinghouse has enjoyed close contact, almost a form of partnership, with utilities for decades — long enough to have gained a helpful understanding of utility problems, objectives and viewpoints. Many utilities say we have done this particularly well.

The Westinghouse Refrigerator represents an ideal product for utility merchandising:

1. Its trouble-free performance has been acclaimed by dealers (based on a recent survey of typical dealers) without dissenting voice. These dealers have had experience with 27 other makes of refrigerators.

2. Its low service cost is cited by 98% of these dealers who have handled other makes. 92% of them say "Westinghouse has lower service expense than any other refrigerator we have ever handled."

3. It offers a complete line. These same dealers have swung over to *exclusive* Westinghouse Refrigerator representation from 29% four years ago to 71% today, involving many discontinuances of other makes.

4. Growing public preference, indicated by the greatest percentage of sales increase in 1935 of any quality Refrigerator on the market.

5. Protection of markets and public good will — Westinghouse basic principles have not changed since the refrigerator was introduced.

6. Co-operation on utility merchandise sales promotions, through specialized staff and service.

These six fundamentals add up to increased profits and good will, to decreased service expense and selling cost.

Detailed information gladly furnished to interested executives of utility administration, merchandising and operations. Address
WESTINGHOUSE ELECTRIC & MFG. CO., MANSFIELD, OHIO

Westinghouse *Refrigerators*

EVERY HOUSE NEEDS WESTINGHOUSE

TABLE III

Company	Extent of Promotion Program	Dealer Co-operation Provided
A	Intensive canvass, demonstrations before clubs, etc. Heavy newspaper and mail adv. Monthly magazine to all customers. Co-op. campaigns and salesmen's contacts	Adv. supports all dealers. Finance on reconditioned refrig.
B	Newspaper and mail adv. Bonus to non-selling employees. Displays. Booster Club plan for users turning in leads. Sales contacts	Encourage dealers to advertise themselves. Stimulate by co-op. league campaigns
C	Intensive advertising and sales throughout the year. No special methods	Co-operate through electrical association
D	Newspaper and mail adv., bill enclosures, truck posters, car cards and radio. Spent $9,584 in 1934—paid part by distributors	Free adv. and counsel. Finance same terms as company. Salesmen help close sales, demonstrations in district offices
E	No promotional program	Participate in co-op. advertising
F	Constant advertising, newspaper and mail campaigns	Adv. features dealers. Sales training, co-op. service
G	Continuous selling—one or two special campaigns yearly with special inducements to salesmen. Extensive newspaper adv. No separate appropriation.	Finance indirectly through economy purchase plan. No further support needed
H	Campaign actively March 1 through summer. Newspaper and mail adv., posters, house organ. Co-op. with manufacturers' campaigns	Support dealer adv. to limited extent
I	Continuous promotion with frequent campaigns	Broad educational program with sales help when requested
J	Cooking schools, refrigeration show, mail adv. to all customers. Appropriation $8,500	Adv. supports all dealers. Sales training
K	Extensive adv. and longer terms this year should bring increase 150–200% over 1934	Newspaper adv. features dealers. Finance in July-August campaigns, dealer charged 1½% per year on sales without recourse. Sales assistance
L	All salesmen sell refrig. Continuing adv. Three campaigns of 4 to 8 weeks with prizes when all salesmen concentrate. Pay $1 for each prospect sold in 30 days. Appropriation average 3½% of est. net sales	None
M	Newspaper and mail adv., billboards and radio 1935. Appropriation 6% of sales	Co-op. adv. and contact men. Pay dealers regular load bonus on prospects carded for company. Home service
N	Heavy newspaper adv. and company shows each spring and sometimes fall. Dealers encouraged to hold shows same time	Clean competitive adv., active co-operation through local association and Refrigeration Bureau, paying 50% for all advertising. Finance 24 mos. 6%
O	Meter-ice plan. Follow mfg. campaign programs	Trade discounts to dealers on purchase from company salesman. Commission on prospects turned in
P	Newspaper and mail adv., stuffers, public demonstrations, electric shows, displays, sales schools, employee sales meeting, campaign contests	Adv. features dealers co-op. with local refrig. bureau
Q	Very extensive adv. and 90-day campaign yearly	Co-op. adv. through local association. Finance 36 months max., trade-ins Sales meetings
R	General balanced program	Adv. features dealers, promote electric refrig. service. Three full-time contact men. Pay salesmen same bonus on dealers' sales contacted by them

weakness in the marketing of this commodity. For there is so large a public acceptance that dealer sales should be high—80 per cent of the total on the national average. And where the utility is mechandising 68 per cent, there is something wrong with the trade. Also, when Company D, which is fourth in size, rates fifteenth in sales it shows that its own volume is low, as also where Company H, which is eighth in size, stands sixteenth in sales. The larger volumes of total sales of utilities and dealers combined all can be credited to dealer activities. And the dealers standing third, fourth and sixth in sales in this table are from the smaller territories.

It is difficult to generalize upon such factors. But certainly 30 per cent saturations and under do not show satisfactory progress today in refrigeration load. In some cases in this table it indicates inadequate selling on the part of the utility itself; in some cases, the weakness seems to lie in the lack of dealer volume. And, of course, dealer activity is in large measure the result of power company leadership and stimulation through advertising and actual selling. The grand total of utility sales for the first half of this year shows an increase over 1934 at the rate of 40 per cent for the full year. Dealer sales for this period of 1933 (for those territories on which full eighteen months are given) show an increase at the rate of 55 per cent for the year. In short, the refrigeration business is good. It is just about as good as the power company wants to make it.

And that is just about the crux of this whole domestic load-building problem. Check over these tables and you see that these companies all do about the same kind of things. They all send out salesmen, though the number of salesmen calling on the home seems to bear little relation to the total refrigerators sold, according to these records. They all advertise.

They all finance their sales and give 24 to 36 months' time. They all co-operate with the dealers to some extent, though this appliance is so well established that the dealer can hoe his own row pretty much. No elaborate programs of co-operation are reported beyond local refrigeration bureaus and featuring the dealer in the utility's advertising.

Refrigeration today is an established business. Volume depends upon the intensity of the selling. That is the most interesting fact reflected by these tables. That, and the further evidence that the job is only half done by many of these power companies, despite the fact that they represent the top twenty in sales for the past year and a half. For if some companies can roll up saturations of from 50 and 68 per cent, those with 25 and 30 per cent have a lot to do—just to catch up.

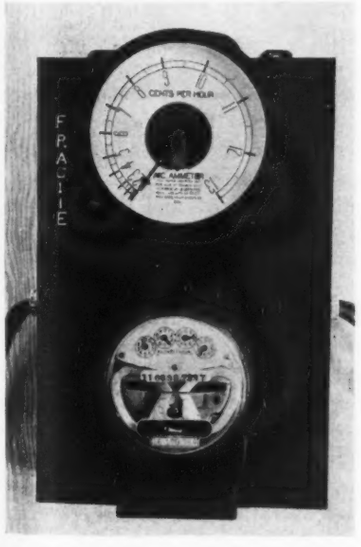
And this is something to think about in these days when load is so badly needed to pay the rising taxes and carry the falling rates. The heyday of refrigeration selling is still ahead. Perhaps the cream has been skimmed, but it is milk we need for nourishment. So it would be well for most companies to look these facts in the face and compare their own records with the eighteen shown here. For refrigeration load in the next few years will be built about as fast as the power company elects—by the intensity of its selling.

BUILDING UP THE LOAD

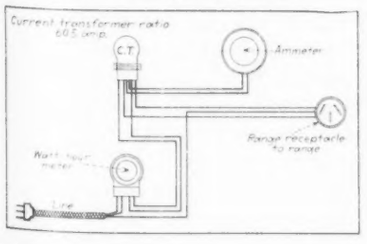
APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

Demonstration Meter Shows Range Economy

To prove to its range prospects that electric cookery is inexpensive, the Portland General Electric Company, Portland, Ore., devised a meter panel for use with range demonstrations. It consists of a watt-hour meter of standard construction and an ammeter which is calibrated to read in cents per kw.-hr. for the cooking rate in the territory served by the company. Thus, when various combinations of the range elements are energized the ammeter pointer moves to the figure corresponding to the cost of operating the range with that combination for an hour's time.



Meter panel shows prospect actual cost of range operation



Direct reading instrument panel indicates simplicity of connections

Calibration of the ammeter to read in cents per kw.-hr. is also a simple operation requiring only a new scale and a short check test.

The panel is simple in construction, being made from equipment that is available in the stock of every utility. It also has proved to be a very effective way both of interesting the customer and selling the economy of cooking electrically.

•

Deferred Bonus Plan Sustains Interest

Rewards come twice to employees of the Iowa Electric Light & Power Company who interest prospective buyers of electrical devices and equipment. The employee turns in a prospect card to the sales department. When the sale is made the employee receives a bonus order to be cashed forthwith. He receives also a credit of bonus points. These points are worth ½ cent each and are cumulative. Twice a year, June 15 and December 15, the bonus points are paid. The effect of paying part and deferring part of the bonus is to keep the employee interested. He always has some money coming. A schedule of points and bonuses is shown in the accompanying table.

ELECTRIFY YOUR HOME AND SAVE WORK
NEW LOW RATES PER KILOWATT-HOUR
1.1¢
0.9¢
Under the new promotional rates extra kilowatt-hours of electricity are available to our residential customers without increasing the amount of the monthly bill formerly paid for service.
For instance:
"My dear, how do you do it? You look ten years younger than you should at your age."
"There's nothing to it! Any woman can if she doesn't do too much housework. Fortunately electricity does mine and I have time for proper rest and recreation."
MONTREAL LIGHT HEAT & POWER
CONSOLIDATED

IN MONTREAL the power company has adopted for its newspaper advertising an attractive symbol to feature its 1.1-cent rate. It frames a modern kitchen with a cord from high line to receptacle

Schedule of Points and Bonuses

Appliances		Bonus Points
Air conditioning*	.....	.....
Brooder	$1.00	45
Cleaner (vacuum)	1.00	45
Clock (residential)	0.25	15
Clock (time)	0.25	15
Cooler (milk refrigerator type)	3.00	600
Corn popper	0.10	10
Curling iron	0.10	10
Dish washer	1.50	60
Fans (ceiling)	1.00	40
Fans (desk)	0.25	20
Fans (ventilating)	1.00	40
Fans (ventilating commercial)	2.00	200
Food mixer (residential)	0.50	40
Food mixer (commercial)	1.00	90
Grill	0.25	15
Hair dryer	0.25	15
Heater (fireplace)	0.50	30
Heater (radiant)	0.25	30
Heater (space)	0.50	30
Heater (water, under 1,500 watts)	2.00	300
Heater (water, 1,500 watts, storage)	3.00	600
Heater (water, rental, 1,500 watts, storage)	1.00	300
Heating pad	0.25	15
Hot plate or disk stove	0.50	60
Iron (flat)	0.15	30
Iron (waffle)	0.15	15
Ironer (domestic)	2.00	120
Kettle (tea)	0.25	15
K. M. oven or potato baker	0.10	30
Lamps (floor or table)	0.25	30
Lamps (indirect)	0.50	120
Lamps (pin-it-up, indirect)	0.40	120
Lamps (pin-it-up, direct)	0.15	45
Lamps (sun)	0.50	120
Lamps (infra-red)	0.30	120
Motors (up to 5 hp.) per hp	0.50	150
Percolators	0.15	15
Pumps	2.00	300
Ranges (domestic sales)	3.00	900
Ranges (rental)	1.00	300
Refrigerators (residence)	3.00	600
Refrigerators (commercial)*	.....	.....
Toasters	0.25	15
Washing machines	1.25	75
Window light fixtures	1.00	120

*Each job separate. Estimates as to points and commission to be allowed are made by division managers.

Load-Building Values of Major Appliances

[*Continued from page 34*]

entirely for a part of the year. In this analysis no adjustment was made for gradual lighting increases. This adjustment would decrease the energy consumed about 4 kw.-hr. per month.

Electric Refrigerator Analysis

Individual Customer Data

Month	(Used Part of Year) Before Refrigerator Purchase Kw.-Hr.	(Used Part of Year) After Refrigerator Purchase Kw.-Hr.	(Used All Year) Before Refrigerator Purchase Kw.-Hr.	(Used All Year) After Refrigerator Purchase Kw.-Hr.
January	31	29	79	122
February	30	25	53	78
March	21	27	53	81
April	20	55	40	87
May	54	61	37	84
June	9	63	34	88
July	9	63	21	79
August	11	78	24	70
September	11	56	33	99
October	20	73	42	88
November	24	72	57	116
December	26	42	63	96
Totals	266	644	536	1,088

Range Analysis Summary

No. of Customers	Customer Months	Before the Installation Kw.-Hr.	After the Installation Kw.-Hr.
268	3,187	143,072	239,817
Per customer month		44.9	75.2
Increase from refrigerator		....	30.3

The same method as for ranges was used in analyzing electric refrigeration customers. These two typical refrigerator installations—one in which the refrigerator was used the year round and another in which it was disconnected from December through March. A comparison of these two types of customers shows that there is considerable additional revenue at hand when some method can be devised of educating the public on the advantages and economics of using appliances the year round. Without adjustments for gradual lighting increases, we can expect an average monthly increase of 30.3 kw.-hr. from each additional electric refrigerator connected to our lines.

Electric Water Heating Analysis

	No. of Heaters	Average No. in Family	Average No. of Months	Average Monthly Kw.-Hr.
Domestic service				
Furnace coil removed	228	3.5	15	249
Furnace coil left in	16	3.5	15	253
Total two groups	244	3.5	15	250
Commercial service	51	...	10	347

On the Wisconsin Power & Light system electric water heaters are on separate meters. It was, therefore, comparatively easy to secure accurate results from these installations. There are two types of electric water heater installations: First, where the furnace coil is removed and all water is heated electrically, and, second, where the electric heater is used in conjunction with the furnace and the customer paying the minimum bill during the winter months. The group of sixteen customers where the furnace coil was left in, for the same size family and the same months, shows slightly higher figures than the others. This apparent discrepancy is probably due to the small number of customers analyzed in this group. An analysis was made at the same time of 51 electric water heater installations in small commercial establishments. Data for an average of ten months shows an average monthly energy consumption of 347 kw.-hr.

•

Commerce Department Gives German Statistics

Germany is the second country to be covered in the World Power Manual and Electrical Exporters' Manual, which is being issued serially by the Electrical Division of the Department of Commerce. Data on the kind of current supplied and on the type of plant are given for about 200 cities with a population of 20,000 or over. The prevailing service is at 220 volts, 50 cycles, but there are many exceptions as to the voltage. Diesel plants are fairly numerous.

Output in 1932 was 23,459,000,000 kw.-hr., of which 13,423,000,000 kw.-hr. came from public and 10,036,000,000 kw.-hr. from private plants. In 1933 about 25,300,000,000 kw.-hr. was produced. The installed generator capacity in the latter year was about 13,000,000 kw., of which 8,000,000 kw. was in public plants. Thermoelectric plants account for 82.9 per cent of the power.

Agricultural and farm consumers are relatively more numerous than in the United States—3,111,456 compared with 8,308,327 small city consumers and 53,700 large industrial. The first-named group used 690,000,000 kw.-hr. in 1933, the second group 2,050,000,000 kw.-hr. and the third 130,000,000 kw.-hr. Streets and public buildings used two-thirds of the 12,150,000,000 kw.-hr. tabulated under "consumption."

Control of A.C. Unloading Tower

[*Continued from page 36*]

switch contacts opened when the bucket cleared the top of the hopper, and did not reset when the bucket was lowered into the hopper. A push-button bypassing those contacts is therefore provided for lifting it from the hopper.

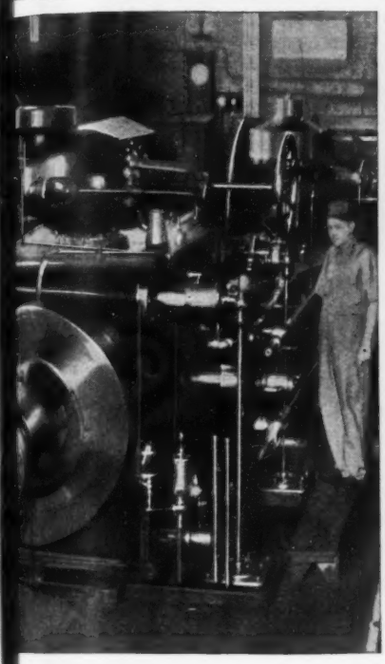
Another push-button provides for releasing the brake and simultaneously applying a small counter-torque to cushion the descent of the counterweight, if this has to be lowered to take up excess slack.

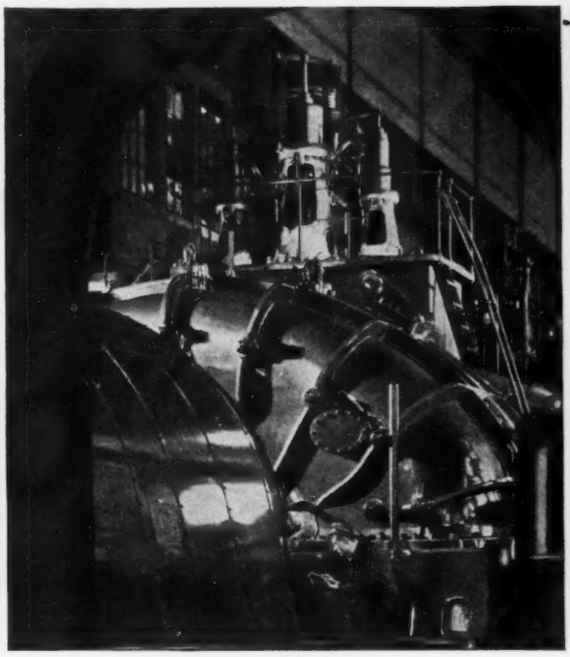
Rack Drive and Control—The rack motor is the same type used for closing and hoisting. It has a thrustor-type brake with a delayed setting so that the trolley will not stop too suddenly and cause violent swinging of the bucket. Reversing, plugging control is used with a four-point master switch and forward-and-reverse limit switches. The reverse limit has a bypass button to permit lowering the bucket to the ground behind the tower.

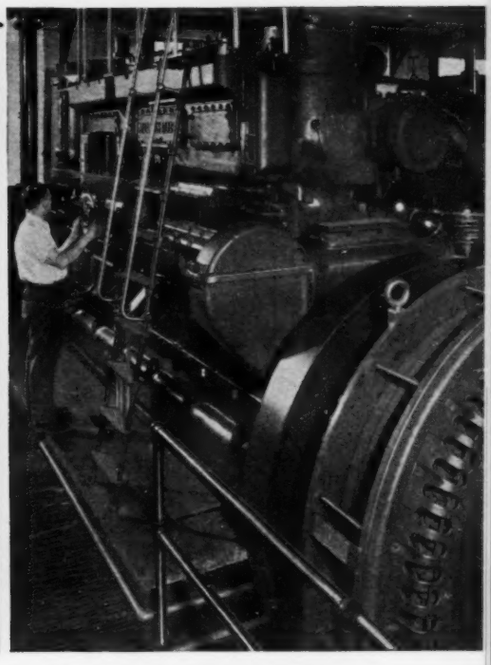
Unusual Barge Shifter—Two motor-driven single-drum hoist engines with brakes and limit switches are situated at the river corners of the machinery house. From these engines two ropes drop down to the river wall, one going upstream and the other downstream, thence over sheaves and back to opposite ends of the barge. Crane-type induction motors and standard thrustor-type brakes are used. Each motor and engine is controlled by a simple reversing controller with limit-switch protection against overreeling in either direction. Each is controlled by a four-point master switch, so the operator may slacken off or tighten either rope independently. However, when both ropes are adjusted, the operator may press a button which actuates two controllers for tandem operation—hauling in one line and releasing the other. Sufficient drag is maintained on the unreeling drum to keep the ropes taut, by extra resistance in the secondary of its motor. Interlocking is provided between the two systems for overload and limit-switch operation, and against simultaneous operation of the "upstream" and "downstream" master switches.

Hopper-Gate Drives—High-torque, elevator-type, squirrel-cage induction motors with across-the-line reversing starters operate the hopper gates and are controlled by master switches at the loading stations.

The HIGHEST QUALITY LUBRICANTS OBTAINABLE *for* POWER PLANTS!







OR STEAM ENGINES

(RECIPROCATING)

CRYSTAL CYLINDER OILS, made in viscosities, highly filtered and specially ounded, insure the maximum of steam er lubrication under some of the most ng steam, temperature and operating tions. GULF CRYSTAL CYLINDER are made by a special Gulf Process and sily atomized. This permits the steam to bute the oil evenly over all rubbing sur- Their decided wetting characteristics are rtant in securing even and easy distribu- over the rubbing surfaces. Owing to their ve qualities they are not readily washed the cylinder walls. GULF CRYSTAL INDER OILS have the lowest carbon resi- of any cylinder oils of which we have d. Where deposits, resulting from bad or high temperature conditions are en- ered, GULF CRYSTAL CYLINDER OILS pecially recommended.

FOR STEAM TURBINES

GULFCREST OILS, made by Gulf's Alchlor Process, and manufactured in five viscosities, represent the highest quality steam turbine oils available. This famous Alchlor Process, patented and owned exclusively by Gulf, is the most thorough and effective refining process yet developed for eliminating all objectionable hydrocarbons. In addition, it synthesizes and rearranges the molecular structure of certain hydrocarbons resulting in the production of a finished oil that stands alone in its resistance to oxidation. These oils form less gum and deposits, less emulsion and sludge when mixed with water, over a period of several years' continuous operation than any other turbine oils of which we have record. Many of America's largest central stations protect their capital investment, insure uninterrupted service, and minimize shutdown and maintenance expense with GULFCREST OILS.

FOR DIESEL ENGINES

GULF PARVIS OILS, approved by more than fifty of America's leading Diesel engine manufacturers and widely used by Diesel engine operators, are the result of a special refining process to produce a stable line of Diesel engine lubricating oils that will insure minimum bearing and cylinder wear and minimum oil consumption. They are especially manufactured to remain stable and with a high resistance to oxidation from the high temperatures of combustion in Diesel engines. Improved by the finest of the new selective solvent processes, these oils have many outstanding records to their credit in operating over long continuous periods and with outstanding economy as to low oil consumption, uninterrupted service, freedom from repairs and low maintenance cost. GULF PARVIS OILS represent the maximum in lubrication to America's best known Diesel authorities and operators.

GULF OFFERS A COMPLETE LINE OF POWER PLANT LUBRICANTS for turbines and engines of every type, old and new. The Gulf engineer is prepared to recommend the type of lubricant which will be most efficient and economical under any given conditions of operation.

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Company.....

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MEN OF THE INDUSTRY

G. R. Carroll New President of Iron and Steel Engineers

G. R. Carroll, who was recently elected president of the Association of Iron and Steel Electrical Engineers (ELECTRICAL WORLD, September 28, page 46), has been electrical superintendent of the Jones & Laughlin Steel Corporation, Aliquippa, Pa., since 1930.

A graduate of the Carnegie Institute of Technology, Mr. Carroll entered upon

G. R. Carroll

his industrial career with the Bell Telephone Company, Pittsburgh, as an equipment engineer. From 1917 to 1922 he was associated with William B. Scaife & Sons, Pittsburgh, in the capacity of erection engineer. Becoming acutely interested in steel mill work, on the invitation of T. M. Girdler, president of the Republic Steel Corporation, who was then general manager of the Jones & Laughlin organization's Aliquippa Works, he became assistant electrical superintendent of that branch. He successfully filled this position until 1930, when he was promoted to superintendent of the department. From that date up to the present time Mr. Carroll has been in full charge of the electrical department.

•

► L. B. F. RAYCROFT, Electric Storage Battery Company, was elected president of the National Battery Manufacturers' Association at its recent convention.

► JOHN PRIMROSE, who has been vice-president of the Foster Wheeler Corporation since it was organized, has been elected vice-chairman of the board, following the resignation of Pell W. Foster, who will continue as a director.

► E. A. CHILDERHOSE, senior engineer of the U. S. Engineers, Missouri River Division office, Kansas City, who has been in charge of designs on the Fort Peck hydro-electric development, has been transferred to the Passamaquoddy tide power project at Eastport, Me.

► HERMAN WEISBERG has been appointed planning and installation engineer, electric generation department of the Public Service Electric & Gas Corporation, Newark, N. J., to succeed the late William F. Rippe. Mr. Weisberg has been employed by the United Engineers & Constructors and predecessor companies since 1922.

•

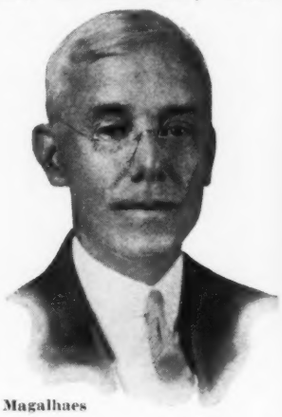
Acheson Medal Presented to Dr. F. J. Tone

Dr. Frank J. Tone, since 1919 president of the Carborundum Company, Niagara Falls, N. Y., has been made the recipient of the Edward Goodrich Acheson Medal by the Electrochemical Society in recognition of his outstanding accomplishments in the field of electrothermics. The presentation was made last week at the meeting of the society in Washington, D. C. He is credited by the society with the origination of the process of obtaining metallic silicon, discovery of silicon oxide, silicon-carbide heating elements. A graduate of Cornell University, he entered the employ of the Thomson-Houston Company, but soon became works manager of the Carborundum Company. The Schoellkopf Medal of the American Chemical Society and the honorary degree of Doctor of Science from the University of Pittsburgh are other marks of recognition of his contributions to electrothermics.

J. H. Critchett (right), president of the society, and Dr. Frank J. Tone

F. V. Magalhaes Assumes New Executive Duties

F. V. Magalhaes has been appointed assistant to Robert B. Grove, executive vice-president of the New York Edison Company, Inc. He has for the past year been connected with the inventory of the Consolidated Gas Company properties. Mr. Magalhaes comes to his new appointment with a background of long experience in the utility field. He



F. V. Magalhaes

served for many years in various departments, finally with the title of general superintendent of distribution and installation, of the New York Edison Company.

He served for approximately 3½ years as vice-president and general manager of the Hall Electric Heating Company. This was an organization affiliated with the General Electric Company to promote the establishment of off-peak rates and to develop and install automatic storage type off-peak water heaters and electric house heating equipment. He traveled extensively in the states east of the Mississippi in the successful establishment of off-peak residential rates in many properties. Some of the first territories where such rates were successfully worked out were Philadelphia, Boston, Virginia and Georgia. He served as one of the liquidating trustees in the voluntary liquidation of the Hall Electric Heating Company in 1932.

In 1932 he was employed by the General Electric Company as commercial representative at the West Lynn factory and again traveled in many of the Eastern states in connection with the development of new metering, service and time-control equipment.

Mr. Magalhaes is a fellow of the American Institute of Electrical Engineers and has had a varied service as member and chairman of committees of

PHILCO announces "**FLOTÉ** (pronounced FLO-TAY) IN STEEL-GLASS" — the latest development of Philco Research and Engineering Laboratories designed specifically to give maximum life and capacity in Control and Auxiliary Power full float operations.

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that body, the former N.E.L.A., the Association of Edison Illuminating Companies and the electrical committee of the National Fire Protection Association. He served for some years as secretary and vice-president of the United States Committee of the International Electrotechnical Commission and was a member of the U. S. delegation to the Geneva Conference in 1922.

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Birmingham Electric Promotes Officials

Three officials of the Birmingham Electric Company received promotions recently. Holland E. Cox, assistant general manager for the past ten years, was named vice-president in charge of sales; C. S. Thorne, formerly chief engineer and assistant to the president, was named vice-president in charge of operations, and G. W. McCracken, electrical engineer, was named chief engineer to succeed Mr. Thorne.

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▶ JOSEPH M. CUDAHY has resigned as a director of the Commonwealth Edison Company in order to give more time to his personal affairs.

▶ PIERRE H. DEHAES, managing director of Etablissements Dehaes, S. A., Kelvinator distributor for Belgium, is visiting the Kelvinator factory in Detroit. He came to this country to study American merchandising methods and manufacturing processes for electric refrigeration equipment. Accompanying Mr. Dehaes is Baron Luigi Parrilli, European manager for Kelvinator Corporation.

▶ DR. FRANK B. JEWETT, president of Bell Telephone Laboratories and vice-president of the American Telephone & Telegraph Company, has been elected president of the New York Museum of Science and Industry. The active support of the museum's ambitious plan by prominent industrial leaders was indicated by the selection of Dr. Jewett. Among the new trustees elected is Gerard Swope, president of the General Electric Company.

▶ GEORGE PERRY has been appointed superintendent of substations for the Peoples Light Company, Davenport, Iowa. Mr. Perry has been with Peoples Light for a number of years, acting as an assistant superintendent, and also was in charge of maintenance work at the substations. He is taking the place of E. A. Barnett, who has retired.

▶ WILBUR K. MILLER, chairman of the Kentucky Public Service Commission since its formation by the 1934 General Assembly, resigned October 1 and was succeeded by Lloyd Clark, a member of the commission. Mr. Miller has returned to the practice of law at Owensboro.

▶ R. H. CLARKE, a director for several years, has been elected chairman of the board of the Apex Electrical Manufacturing Company, Cleveland, Ohio.

G. C. LEWIS RECEIVES CHARLES ELLETT AWARD

The Charles Ellett award, given annually by the Western Society of Engineers, was presented to Grover C. Lewis of the Public Service Company of Northern Illinois at the recent annual dinner meeting of the society for the most outstanding technical paper during the year prepared by a junior member. The subject of the paper was "Residential Electric Rates." C. C. Whittier, retiring president of the society, presents the trophy to Mr. Lewis, while Frank F. Fowle, new president of the society; Colonel Willard T. Chevalier, McGraw-Hill Publishing Company (left), and B. F. Affleck, Universal Portland Cement (right), look on.

OBITUARY

▶ N. G. HARVEY, formerly president of the Illinois Electrical Supply Company, Chicago, died August 28 at Pasadena, Calif., where he had resided since 1928, the year of his retirement from active business life. Mr. Harvey was president of the Electric Association of Chicago, relinquishing this office also upon establishing residence in California.

▶ HENRY A. WYMAN, director or trustee of the Massachusetts Lighting Companies, New England Power Association, International Hydro-Electric System, Massachusetts Utilities Associates, and for many years prominent as a legal adviser of important business enterprises in Massachusetts, died at sea September 25 in his seventy-fourth year. He was born in Skowhegan, Me., and was at one time Attorney-General of Massachusetts.

▶ E. E. ARMSTRONG, manager of the Hattiesburg district of the Mississippi Power Company, died in that city September 24, following an appendicitis operation. Mr. Armstrong was a graduate in engineering, University of Missouri and had been connected with the Doherty interests at Denver, New York, and later in Meridian, Miss. When Mississippi Power Company took over the Doherty interests in Hattiesburg Mr. Armstrong was made manager.

▶ FRED A. ROGERS, for many years an official of utility companies in New York State, died at White Plains October 1, after a brief illness. He was 66 years old. At the time of his death he was assistant treasurer of the Niagara Hudson Power Corporation and was also treasurer of the Northern New York Utilities, Inc.; treasurer and a director of the Power & Electric Securities Corporation and assistant treasurer and a director of the Oswego River Power Corporation.

▶ OLIVER P. MOSS, manager of the Blytheville Water Company and formerly general manager of the Arkansas-Missouri Power Company, died suddenly, October 8, at his home in Blytheville. He was 50 years old. A native of Columbia, Mo., Mr. Moss transferred his interests to Blytheville in 1919 as local manager of the Arkansas-Missouri Power Company when it was organized to take over the Blytheville and neighboring plants. In 1927 he became general manager, a position he held until he resigned in 1933. He had been associated with the Arkansas Power & Light Company and a Texas utilities company before becoming affiliated with the Arkansas-Missouri Power Company.

Why FWD is Considered the Truck for Line Construction and Maintenance

FOUR-WHEEL drive with full center differential action gives the truck the necessary traction for this strenuous work. Set-back front axle insures correct weight distribution. Front axle is most rigid type known in automotive practice. Power on the front wheels utilizes the weight for securing additional traction — a big advantage in getting in and out of the difficult places where lines are located. Wide range of gear ratios permits heavy lugging or fast travel as required. Truck is closely coupled, giving better control under any condition. Transmission gears cannot be stripped. The unit is engineered for proper mounting of line construction and maintenance equipment so that maximum operating performance is secured.

FACTS ABOUT FWD TRUCKS

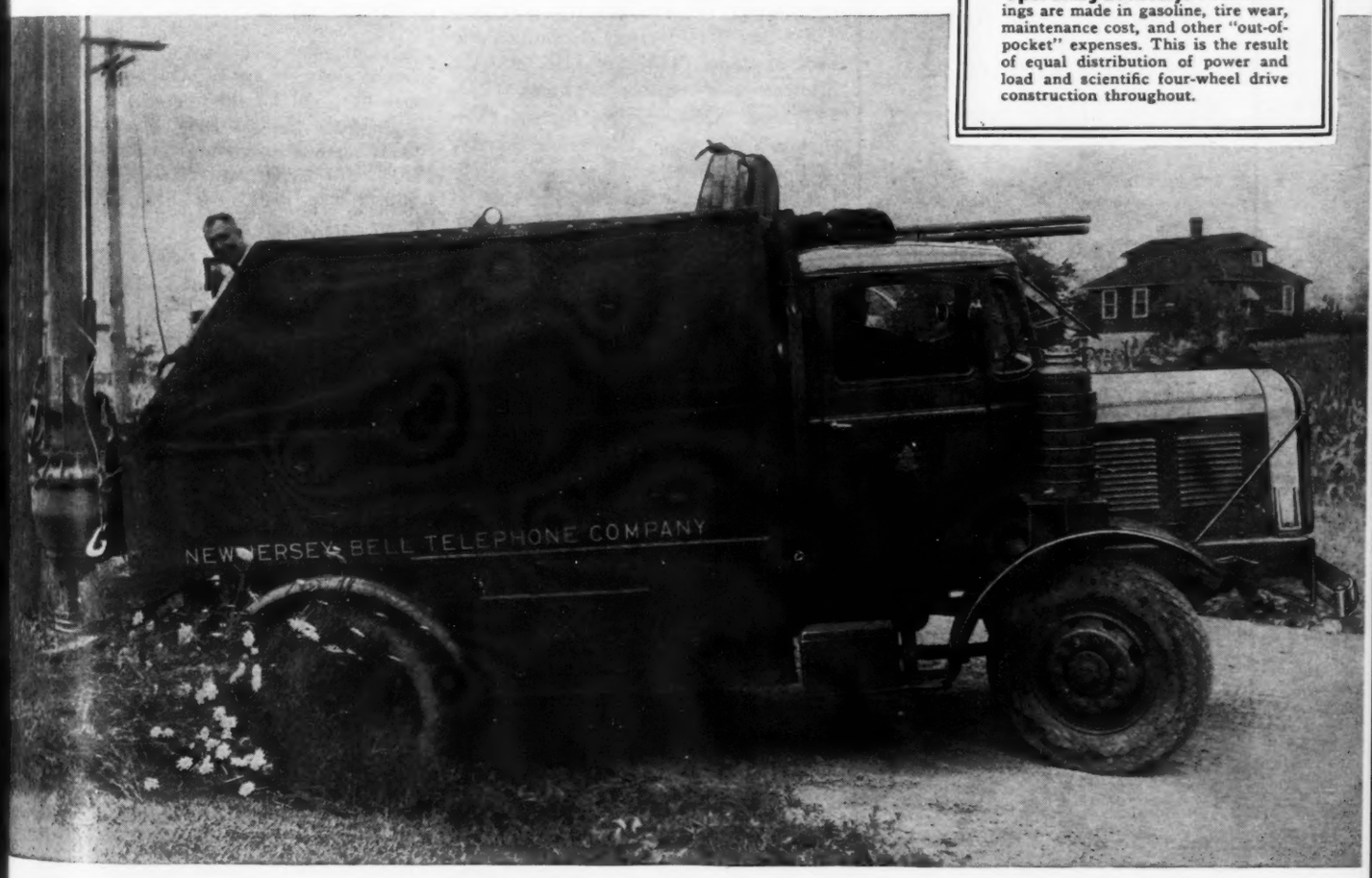
Faster Service. FWD's with their powerful engines, wide range of gear ratios and four-wheel traction cut down trip-time by being able to "make" the hills, curves, and poor going, faster than average trucks. No necessity for over-speeding on the straight stretches.

Greater Safety. Front axles are set back. *Power*, as well as load on all four wheels, gives the FWD sure footing on slippery pavements, in congested traffic, and when going around curves.

Wider Range of Operation. Four-wheel traction enables the FWD to handle its regular hauling job easily and do the tough jobs as a matter of course.

Greater Dependability of Service. Reserve power, rugged construction throughout, and true application of the four-wheel drive principle, insure continuous operation under any condition. Backed by a nation-wide organization of parts depots and service men available at a moment's notice.

Operating Economy. Definite savings are made in gasoline, tire wear, maintenance cost, and other "out-of-pocket" expenses. This is the result of equal distribution of power and load and scientific four-wheel drive construction throughout.



FWD TRUCKS

Write today for recommendation for line truck for your service

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wisconsin
Canadian Factory: Kitchener, Ontario

☐ The Snow Removal Problem ☐ Use of Extreme Pressure Lubricants ☐ Truck and Trailer Size and Weight Restrictions ☐ Effects of Front Wheel Stability on Public Safety ☐ Purdue University Efficiency Test ☐ Cutting Costs with the FWD Road Maintainer ☐ Making the Most of Controlled Power.

Mr. _____

Title _____

Address _____

City _____ State _____

BACKED BY AN INTERNATIONAL SERVICE SYSTEM

People shop more on well-lighted streets - - - -

...build up the commercial load thru Better Street Illumination

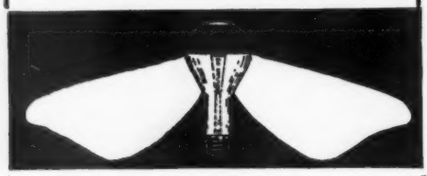
As most people prefer to do their evening buying from stores located on adequately lighted streets, a dual result always follows the adoption of proper street lighting methods. First, a more satisfied public and second, an increase in the current consumption on the part of shops.

From 30 to 50% more effective street illumination can be had with the same equipment by adopting SILVRAY "MULTIPLEX" PROCESSED LAMPS.

These control and direct the light without the aid of separate reflectors, and are being widely used because of their efficiency and economy.

Write for full details or let one of our Engineers talk to you about a survey or recommendations. There is no obligation.

SILVRAY
"MULTIPLEX" PROCESSING



American
Street Illuminating Company
261 No. Broad St., Philadelphia, Pa.
"Backed by 57 Years of Street Lighting Experience"

Record of a Co-operative Farm Line

[*Continued from page 37*]

more than a total of $2.75." The excellent record data covering the whole history of the line and the condition disclosed by analysis of these records prove the management to be, and to have been, careful, conscientious and competent in matters of obvious administration and at the same time wofully incompetent on technical points and in the less tangible, but none the less very real affairs of business accountancy.

The table on page 37 presents an over-all picture of the 14.83 years of operation of the line. This table was compiled from more detailed assemblies of data contained in the study. Also, the table contains certain derived figures that do not appear in the study, but which seem significant to our present purpose. These are the average consumer figures of items (17) and (19) and the kilowatt-hour figures of items (23), (24) and (25). These figures show that never during the whole history of the line has the average consumer paid anywhere near the full cost of serving him nor has any unit of energy been sold at other than a thumping loss.

Examination of the table shows that the income of the line was maintained, obviously by intention, at a level just about sufficient to cover actual disbursements. Evidently the sums of money put up by the original incorporators and by the five others who shortly joined them were considered to be dollars gone forever after the investment had been made. That the investment should maintain itself unimpaired and should pay interest received no consideration at all. Proof that no great effort was made to have payments for service, consisting of energy and transformer charges, to cover operating costs entirely appears in the breakdown of average annual income in the note on item (17). These figures show the average yearly deficit assessment to be $297.40, each stockholder having been required to pay annually an amount varying from $3.50 to $13 year to year over and above his payments for service.

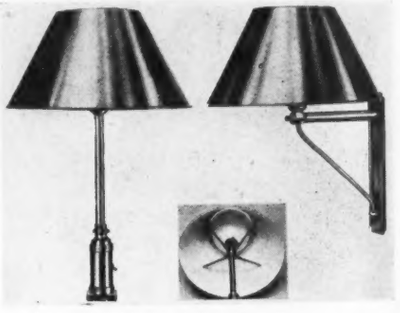
Figures from the study, not included in the table, show that the average per customer use of energy on the Kegley line has been 30.3 kw.-hr. per month. The range between users for the full period of operation of the line is from 11.8 to 46.9 kw.-hr. per month. These figures of energy usage demonstrate very clearly that the availability of electricity under communal auspices, even at rates that ignore capitalistic elements of cost, is not of itself sufficient to persuade customers to make that full use of electricity which is today accepted as a necessary component of the abundant life. A social undertaking cannot achieve the results in improved living that follow on commercial enterprise and active selling.

•

For Better Eyesight at Annapolis

Of the 35 per cent of Naval Academy cadets who fail to graduate for various causes, many of those disqualified for physical disabilities owe their misfortune to eye troubles. Because of the importance of good vision in the navy, the entrance eye tests are rigid, yet every year men drop out for this reason.

Recently the academy medical staff made an intensive study of the lighting conditions in Bancroft Hall, where the midshipmen live. The illumination in



Naval Academy standardizes on a "Better Sight" study lamp

use was found deficient. After a study of available lighting equipment, units made by the Greist Manufacturing Company were selected embodying the I.E.S. principle of semi-indirect illumination. Wall brackets were installed in the 400 single rooms and table study lamps in the 1,000 double rooms, several new features being introduced. A durable metal shade is built into the unit, so that luminaire and bulb can be removed without disturbing the shade. The table unit is bolted to the table to insure its being in the right position for study. Both units are of solid brass and copper construction.

The installation was to be completed in September. It can be credited to interest created by the Better Light-Better Sight Campaign.

Recent Rate Changes

Conowingo Power Company has been ordered by the Maryland Public Service Commission to reduce its rates $45,000 a year. In the same order the commission set the fair value for rate-making purposes of the property of the company at the end of last year at $905,774. The company was also ordered to submit amended schedules within 30 days providing for the reduction. Public hearings on the rates, charges, service, property and affairs of the company took place in May and June of this year and were held when the commission failed to reach an agreement with the company on a voluntary rate reduction. The company has filed a protest against the commission's order.

•

Buffalo General Electric Company has filed with the New York Public Service Commission a revision of its electric rates which are estimated to make reductions to about three-quarters of the smaller commercial and industrial customers. In addition the revised rates take the first step leading to the eventual elimination entirely of the so-called counted-socket rate for commercial customers and to eliminate entirely any element of demand in the rate for commercial customers with less than 5 kilowatts demand. The commission permitted the revised rates to become effective October 14 without approval or disapproval. The company estimates that the revised rates will save consumers at least $256,700 annually.

•

Ohio Edison Company was granted a new three-year electric light franchise which will save Akron's 55,000 consumers $110,000 a year. The rate reduction was the second negotiated by the City Council in eighteen months, an ordinance passed in May, 1934, having netted savings estimated at $620,000 a year to consumers. The new ordinance calls for payment of 5 cents a kilowatt-hour for the first 20 kw.-hr., 3½ cents for the next 30, 3¼ for the next 50, 2½ for the next 100 and 1½ for all over 200. Savings of $30,000 to $70,000 a year will accrue to domestic and commercial consumers under new rates to be established by the company next month in Youngstown.

•

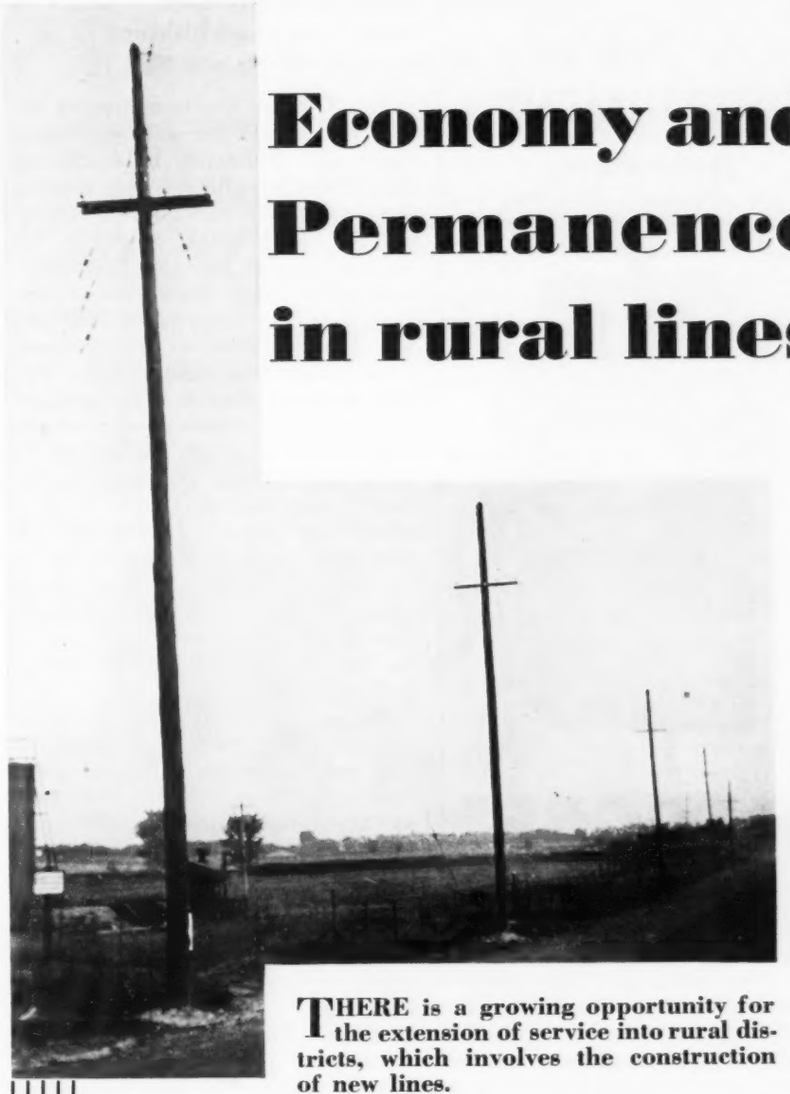
Niagara, Lockport and Ontario Power Company and Newfane Power & Water Supply Company have filed with the New York Public Service Commission a revision of rural residential rates applicable for electric service outside of cities, villages, hamlets and lighting districts which is estimated to save some rural customers about $25,000 annually. The new rate will involve a desirable change from the complicated and objectionable room count form of rate to the simple energy block form of rate.

•

North Kansas Power & Light Company has announced rate reductions averaging 19 per cent for residential lighting, commercial lighting and power, and farm service for the towns of Alma, McFarland and Paxico.

•

Long Island Lighting Company has filed with the Public Service Commission schedules of new electric and gas rates expected to save its customers $646,900 annually. Residential electric consumers will save $358,200 under the new schedule, commercial users $145,400 and 75 buyers of power at the wholesale rate will save $49,300. The commission has neither approved nor disapproved the proposed rate schedules, nor will it take any action in the matter. Thus the rates become effective November 4, 30 days after filing.



Economy and Permanence in rural lines

THERE is a growing opportunity for the extension of service into rural districts, which involves the construction of new lines.

The ultimate load can be forecast for such lines much more accurately than is possible in more congested districts. Line construction details can therefore be selected with a view to permanence.

If such lines are to be profitable, economy of construction must be combined with permanence. One way to secure this result is to take full advantage of the long life and low annual cost of AmCreCo Poles.

They offer strength that permits the economy of long span and the durability of full pressure creosote treatment that provides for the longest serviceable life of any poles commercially available.

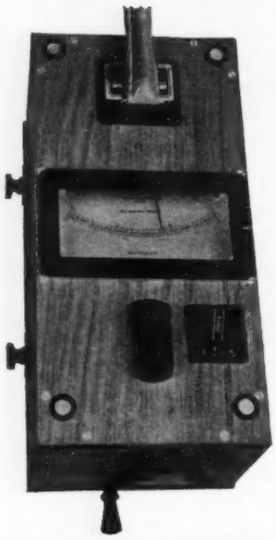
Why AmCreCo Poles Have Maximum Quality

1. Select southern yellow pine.
2. Incipient decay avoided.
3. Framing before treatment.
4. Preservative of known value.
5. Adequate single treatment.
6. Treatment accurately timed to proper seasoning.
7. Full length pressure treated.
8. Unequalled facilities and personnel of the leading producer.

AMERICAN CREOSOTING COMPANY
INCORPORATED
COLONIAL CREOSOTING COMPANY INCORPORATED
AMCRECO LOWRY PROCESS CREOSOTED WOOD
GEORGIA CREOSOTING COMPANY INCORPORATED
LOUISVILLE — KENTUCKY

A NEW INSTRUMENT

for measuring electrostatic capacity



"MEGGER"

TRADE MARK REGISTERED U.S. PAT. OFF.

CAPACITY METER

is a direct-reading, multi-range microfarad or capacity meter, having the outstanding advantage of automatic compensation for parallel resistance leakage to as low as 10,000 ohms. To measure capacitance it is merely necessary to make two connections, turn the crank of the hand generator and read the scale,—no adjustment except for range. There are four scales—0 to .3, 0 to 1, 0 to 3 and 0 to 10 microfarads.

In addition to miscellaneous measurements of electrostatic capacity—such as capacitors (condensers) of all sorts—the "Megger" Capacity Meter has a very important application in locating open-circuit faults in power cables. A measurement of capacitance to the fault compared with that of a known length of good cable gives a quick and accurate indication of the distance to the fault.

Write for descriptive Bulletin 1405-W giving additional details on this new and unique "Megger" instrument.

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

Other Biddle Specialties:

"Megger" Insulation Testing Instruments
"Megger" Ground Testers
"Ducter" Low Resistance Testing Set
"Dionic" Water Tester
"Frahm" Vibrating-Reed Tachometers and Frequency Meters
"Jagabi" Rheostats
"Jagabi" Speed-Measuring Instruments

Getting Acquainted With Our Stockholders

[*Continued from page 45*]

Shortly after the formation of the first few groups the state legislature convened. Numerous bills affecting the utilities were introduced, some of them extremely vicious. The president of the company, of course, appeared at many hearings and before many committees. To the stockholder groups he sent analyses of bills and copies of his statements to committees. Soon he was surprised to have one, then another, then a few more and then quite a number of stockholders come to him and ask, "What can we do to help block this bad legislation?" He told them they could do a number of things. They could talk personally to their representatives in the legislature and to other elected officers. They could circularize and present petitions. They could come to the hearings themselves and present their opinions.

As was to be expected, the stockholders at first wanted the company's help and direction in doing these things. But it was easy to make them see that the company would harm itself by such action and that, to be truly effective, whatever they did would have to be entirely on their own initiative and responsibility. And the stockholders began to buttonhole legislators and present petitions and demand to be heard at committee meetings. They did these things of themselves, and by themselves, and soon, having learned how, they began to get a kick out of it. As a matter of fact, the president actually advised some of his stockholder spokesmen not to go to certain hearings because in the particular instance the danger had been averted and their services would be more effective on some later occasion. The point of all this is that many people came to Madison from all over southern Wisconsin at their own expense, told their own stories in their own way, all without any coaching or direction from the company, just to do what they could to protect their investments.

Undoubtedly the political effect of these stockholders' organizations was and is very great. It was so great that last winter the lobby investigating committee of the legislature—yes, Wisconsin had one, too—criticised the president of the company because he had dared to organize the stockholder groups and then keep them informed of matters affecting the company. But they did not get very far with that, for when the committee began to call a few of the stockholder representatives to testify they got the surprise of their lives. One investigator tried to browbeat a witness, "You claim to represent 2,000 stockholders in your community. Yet at the meeting at which you were elected only 500 were present. How can you represent 2,000 when only 500 elected you?" The witness replied with another question, "Do you represent all of the people in your district or only those who elected you?" Of course, the statesman could return only the obvious answer, however far from the truth it may have been. The committee had about half of the officers of the stockholders' groups in to testify, but in every case they found that where they had expected to catch a rabbit they had instead on their hands a porcupine with very sharp quills and very anxious to use them. This political effect of the stockholders' organizations is actually an unexpected by-product of the original purpose, which was only to improve local customer relations. But the political value of the organizations is a legitimate thing.

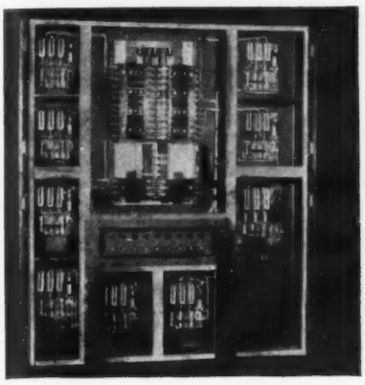
It must be apparent now to every thinking man that the headlong rush of politicians to align themselves against business and against private enterprise cannot be stemmed by anything short of organized opposition by the thrifty people who have saved their money and put it into business ventures of all kinds. And such organization cannot be achieved alone by such a body as the American Association of Investors. This group has done effective work in the recent past and will, let us hope, continue to do as well in the future. It should have the generous financial and moral support of all who can afford to give and who understand its aims. But there are hundreds of thousands of utility investors like many among the 18,000 of Wisconsin Power & Light who literally cannot afford to give financial support to a national organization and who, to tell the truth, are a little overawed by it anyway. But these investors will join in with their friends and neighbors in a local organization which has a social value in their lives. And they can be wonderfully active in circulating petitions and in talking to town and ward politicians. And how powerful they can be on election day!

In the last analysis national politics is only the sum of local politics. If there existed all over the United States local stockholder groups like those in the divisions of the Wisconsin Power & Light Company the national political effect would be accomplished by the mere fact of their existence.

NEW EQUIPMENT

Motor Control Center

Control of any group of motors such as are used on a coal tipple, in a machine shop or industrial plant is possible from one central point with this control center. It consists mainly of a distribution panelboard and a series of compartments for housing motor starters. Distribution panel is of the circuit breaker type, having a set of busbars with



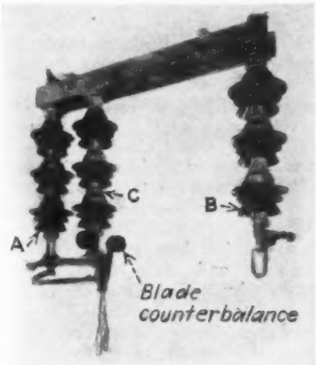
Separate doors for starter and panelboard compartments; sponge rubber gaskets around all doors for dust protection is provided if desired. **Penn Electrical Co.**, Irwin, Pa.

main terminals. Magnetic type starters are used and can be of any make, depending on requirements. Motor control push buttons can be placed either on the front of the control center or located near the motor as desired. Wiring between apparatus mounted in the control center is furnished complete.

•

Balanced Blade Switch

Assembled for inverted mounting, this high-voltage switch is so adjusted that in event of failure of any link of the operating mechanism the balanced blade will not fly closed or fall open. Two rotating insulator stacks are provided per pole—(A) at the blade hinged end and (B) at the contact end. Stack (A) operates a crank arm con-



Type **FMR-239** for motor or manual operation; rating 115/132-S kv., 600 amp. **Delta-Star Electric Co.**, Chicago.

nected to the hinged blade on the third or stationary stack, the blade being lowered or raised from this point. Rotating stack (B) operates the main H-shaped contact which mates with the blade's forked contact. Blade contact is of the pressure line type. Large contact areas are provided for heat dissipation and to insure proper contact pressure.

•

High Speed Solenoids

Built to stand continuous use, these solenoids are capable of working at rates up to 200 operations a minute. A general-purpose type develops pulls ranging from ½ to 90 lb. The high-speed type includes sizes up to

Pull ranges available, ½ to 90 lb.; operating rates to 200 per minute; full laminated type shown. **Trombetta Solenoid Company**, Milwaukee, Wis.

35 lb. pull for 200 operations per minute. A long stroke type is also available with pull capacities to 35 lb. operating 25 times a minute.

•

Electronic Microsecond Timer

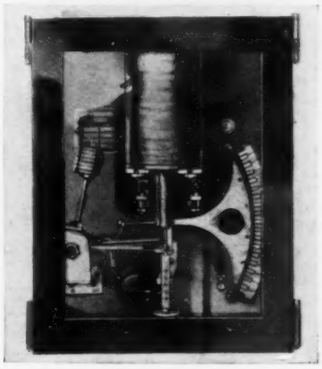
Direct readings of time in terms of a thousandth of a second can be obtained with this electronic timer. The method used for determining time is to charge a condenser

Used on 115-volt, 60-cycle power system; time values obtained by simple conversion of voltmeter scale. **General Electric Co.**, Schenectady, N. Y.

at a known rate during the interval and then measure the voltage built up on the condenser. Charging of the condenser is controlled by two "Thyratron" tubes, one to start and one to stop current flow. Condenser voltage is measured by a vacuum tube voltmeter arrangement, using a bridge circuit so that the condenser charge is maintained during the reading period.

Voltage Adjuster

Intended for use in controlling small alternators in industrial and municipal installations, hotels, garages, etc., where voltage regulator requirements are not too



Controls a.c. generators rated from 5 to 250 kva., 360 to 3,600 r.p.m.; dimensions, 8½x11x9½ in. **Allis-Chalmers Mfg. Co.**, Milwaukee, Wis.

exacting. The "rocking contact" design of the more expensive regulators is used, although a solenoid operator is used to replace a torque motor and an air dashpot instead of magnetic damping.

•

Vibration Counters

Type 514 for high-tension lines; registers 99,999 vibrations without repeating. **R. W. Cramer & Co.**, New York City.

Attached directly to transmission line conductors, this device is used to determine the actual number of vertical vibrations to which the line is subjected over a period of time. The instrument, weighing less than a pound, is clamped to the conductor with the dial face down. Its registration can be read from the ground with binoculars. Vertical vibrations of any frequency over four per second are registered cumulatively.

•

Rural Line Transformer

This transformer, designed for rural lines, has the winding and the core suspended from the cover, which can be adjusted to permit positioning of the secondary bushing with respect to the pole or secondary rack. The cover can be rotated through 90 deg., thus allowing adjustment without removing the transformer from the pole. This type of transformer is for use on three-phase, four-wire Y systems with grounded neutral. It is single phase and connected between high-voltage phase wire and grounded neutral.

Designed for 2,400, 4,800, 7,200 and 7,620 volts. **Kuhlman Electric Company**, Bay City, Mich

Capacity Meter

This small, multi-range capacity meter provides full scale ranges of 10 to 1 to 0.1 to 0.01 mfd. It operates directly from 115-volt, 60-cycle current. A voltage adjuster compensates for small variations in line voltage and an internal transformer insulates the device from the line.

Model 780, weight 1¾ lb.; dimensions 3¾x2½x5½ in. **Weston Electrical Instrument Corp.**, Newark, N. J.

•

Transformer Fuse

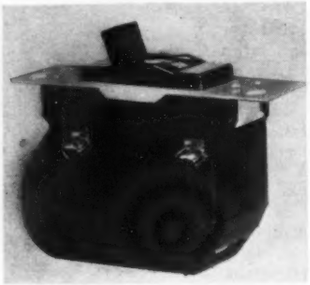
This drop-out type of fused cutout for distribution systems differs from other similar equipment in that the fuse holder is totally inclosed in a porcelain housing which acts as an insulating "umbrella" to protect the holder from moisture, dirt and foreign matter. A latch which holds the fuse holder in place against spring pressure is released when the fuse blows, allowing the holder to drop into view. The device is said to be easily refused and replaced with the aid of a switch stick.

"Transfuse" available in three voltage ratings for 5,000, 7,500 and 15,000 volts. **Johnson Manufacturing Co.**, Atlanta, Ga.

•

125-Volt Circuit Breaker

This primary circuit breaker for outlet box mounting provides short-circuit and overload protection on 125-volt a.c. or d.c. circuits. It can also be used as a switch control for branch circuits. It eliminates the inconvenience of replacing blown fuses and prevents overloading of circuits by use of heavy fuses. The mechanism of the breaker (which closely resembles a tumbler switch) cannot be locked by the handle while the circuit is overloaded.

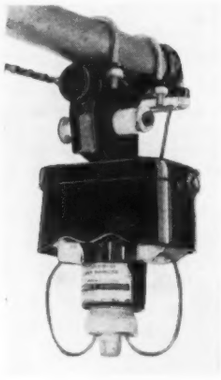


For installation in standard outlet box with raised cover and brass plate. **General Electric Co.**, Merchandise Dept., Bridgeport, Conn.

•

Improved Lamp Hanger

Improvements in this outdoor lamp hanger allow it to be readily lowered out of the electric circuit by a single man working from the ground for safe and easy cleaning and servicing. Removable contacts on the lowered member are wired to the reflector instead of being built into the hanger body. Thus, interchange of reflectors is possible without rewiring the contacts. A two-piece canopy, the skirt of which can be released and lowered, permits easy access to upper or stationary member for cleaning or wiring.



Available with one- or two-piece canopy as desired. **Thompson Electric Co.**, Cleveland, Ohio

•

Maximum Demand Register

Retaining essential features of previous demand meters of this make, this meter has been improved by incorporation of a simpler interval selector and interval reset mechanism. This demand register, with its 100-tooth worm-wheel construction, can be applied directly to any service type HF or HC meter by changing the meter spindle and upper bearing to 100-tooth construction and to any service type H meter by using a mounting bracket having necessary gears incorporated to equalize the difference in the fundamental test constant between types H and HF meters.

Type HG; standard time intervals are 15 and 30 minutes; interval timing mechanism reset by timing cam. **Sangamo Electric Co.**, Springfield, Ill.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

"Motors for Centrifugals," bulletin No. 601 of the Louis Allis Company, Milwaukee, discusses in two pages the types of motors used in centrifugal extractor service, their characteristics and advantages.

Deep-well turbine pumps are the subject of 8-page bulletin W-450-B176 of the Worthington Pump & Machinery Company, Harrison, N. J. Items of interest include cross-section views showing details of construction, with explanatory notes; tables of sizes and capacities, as well as a list of applications.

Group-operated disconnecting switches, pole-top mounting frames and control assemblies are described and their specifications tabulated in bulletin 263-A of the Southern States Equipment Company, Birmingham, Ala.

Principles of light distribution and control are explained and illustrated and a number of installations of "Inbilt" lighting are described in a 16-page publication of the Holophane Company, Inc., 342 Madison Avenue, New York City.

Methods used by machinery manufacturers to secure necessary details regarding customers' orders, so that the equipment when shipped will be satisfactory, are fully discussed in an interesting and authoritative publication of the Metropolitan Life Insurance Company, Madison Avenue, New York City. Ask for bulletin B-324 (19 pages). Typical data sheets used by various manufacturers are included, together with quotations of the different manufacturing executives on the methods they employ to insure adequate specifications.

Pump and motor engineering data (5 pages), tables of size, capacities and dimensions, as well as a descriptive text which covers fundamental principles, advantages, construction and operation of Hele-Shaw pumps, motors and transmissions are in catalogue F (41 pages) of the American Engineering Company, Philadelphia.

High-tension, rural switching equipment is described and illustrated in bulletin 35-B, Delta-Star Electric Company, 2400 Block Fulton Street, Chicago. Ratings and dimensions are tabulated.

Concerned primarily with the engineering features of type BFR automatic branch feeder voltage regulators is leaflet 2204 (7 pages) of the Allis-Chalmers Company, Milwaukee. Design features are taken up individually and described with photos and wiring diagrams.

Loading data, dimensions and specifications of SKF ball and roller bearing transmission appliances are in a 30-page publication of SKF Industries, Inc., Front Street and Erie Avenue, Philadelphia. Several pages of engineering formulas on selection of bearings are included.

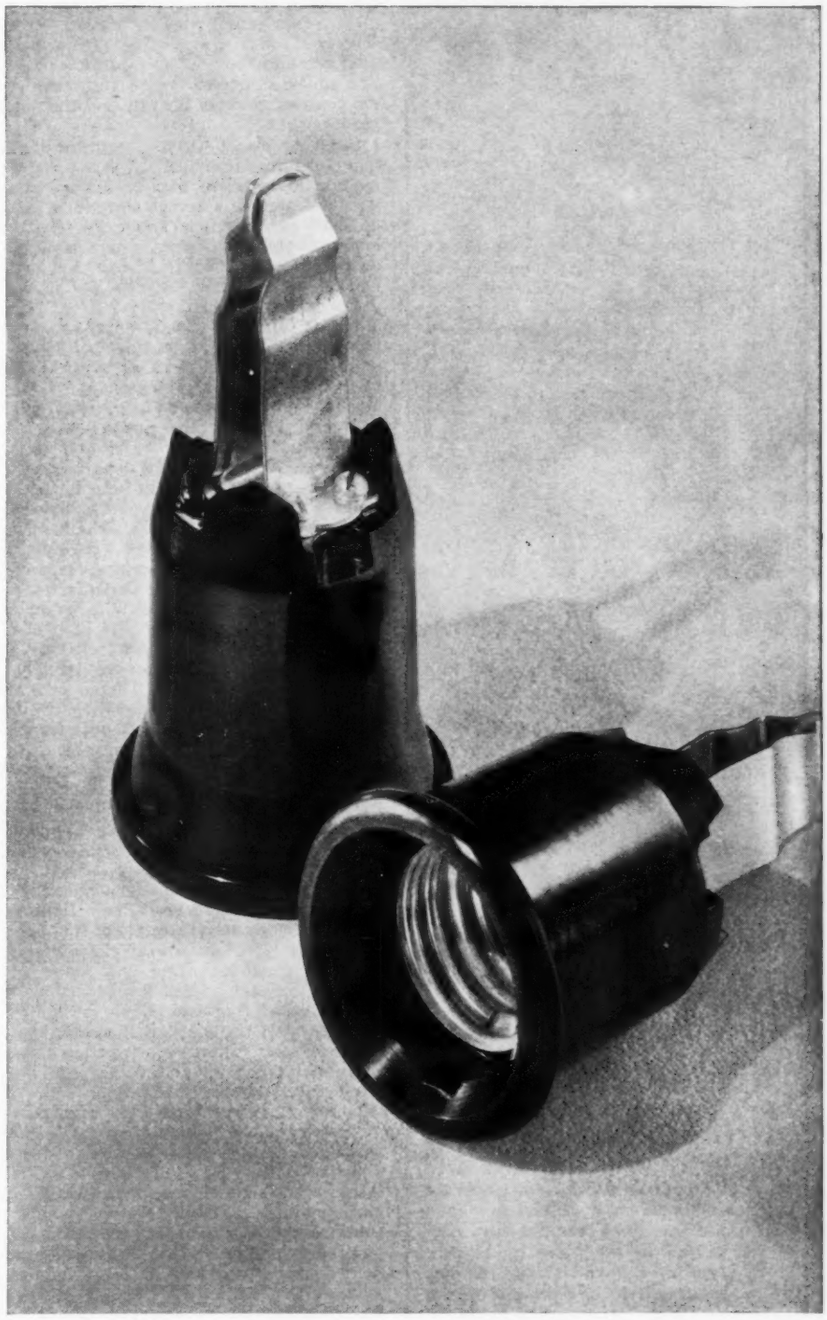
A 14-page bulletin describing systems for cinder reclaiming and fly ash disposal is available from the United Conveyor Corporation, 1200 Old Colony Building, Chicago. Numerous layouts illustrate the application of this equipment to existing boiler plants.

Modern service drop and entrance cables are discussed and their features are summarized in tabular form by a recent bulletin No. SE2 of the General Cable Corporation, 420 Lexington Avenue, New York City.

Tracing the history of lightning arrester development in one firm over a period of 43 years, a recent 12-page booklet of the Electric Service Supplies Company, 17th and Cambria Streets, Philadelphia, Pa., describes the steps leading up to the development of "crystal-valve" arresters for protection of power-line equipment.

Reducing Weather Hazards

...in Street Lighting Circuits



RAIN, snow and sleet—freezing cold and blistering heat, are a constant menace to the uninterrupted service of street lighting systems. These weather hazards demand that the exposed insulation in the circuit be highly resistant to their attacks.

In designing the Mogul lamp sockets pictured on this page, the Line Material Company, of South Milwaukee, Wis., has substantially reduced this common hazard. The use of tough, weather-proof Bakelite Molded for the heavy shells of the sockets not only affords important electrical advantages, but also gives practical insurance against deterioration under any climatic or atmospheric conditions.

The makers of hundreds of other electrical devices and parts are finding similar special advantages in the use of Bakelite Molded. This material combines tensile strength, electrical insulation value and high resistance to moisture, fumes, and temperature and atmospheric variations. It does not deteriorate, and retains its physical and electrical properties unimpaired for an indefinite period. In addition, Bakelite Molded offers important improvements and economies in production and assembly.

Engineers and manufacturers are invited to consult our technical staff about the use of Bakelite Molded in electrical apparatus and appliances. On request, we will be glad to send a copy of our informative booklet 3M, "Bakelite Molded".

BAKELITE CORPORATION, 247 Park Avenue, New York, N.Y. ..... 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

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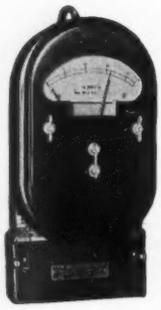
"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" in the numerical sign for infinity, or unlimited quantity, it symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

1910 — SILVER ANNIVERSARY — 1935

DEPENDABILITY
low maintenance cost

The simplicity of operation of Lincoln Demand Meters results in dependability and low maintenance cost. In Lincoln Demand Meters, only one simple unit, comprising of a shaft and pointer and two bimetallic coils, moves—and that SLOWLY. They are free of timing mechanisms and of all rapidly moving parts.

LINCOLN
DEMAND METERS



Watt Demand and Ampere Demand meters for every requirement. Indicating or Graphic.

INDEPENDENT OF THE WATTHOUR METER

Lincoln Demand Meters operate independently of the watthour meter. They are merely connected to the same load. One type of Demand Meter for any make or type of Watthour Meter.

LINCOLN METER CO., Inc.
Springfield, Illinois

Municipal Items

LODI, CALIF.—Temporary restraining order to prevent the sale of $466,000 in bonds voted by the city for the erection of a hydro-electric plant has been granted by the district federal court in San Francisco in a suit brought by Pacific Gas & Electric Company to enjoin both the sale of the bonds and the receipt of a $148,000 federal grant. The company, which now furnishes power wholesale to the city, contends that the city-owned plant would render useless its $150,000 Lodi substation and deprive it of $78,000 in annual revenue "without due process of law." The suit also attacks the constitutionality of the contract between the city and the federal government.

CALIFORNIA—Efforts to extend the Central San Joaquin Municipal Utility District to include the western half of Fresno County were defeated in a recent election by a vote of 2,589 against annexation to 1,570 for annexation. The district proposes to erect or purchase an electric distribution system and is now served by the San Joaquin Light & Power Corporation.

FORT COLLINS, COLO.—Public Service Company of Colorado, which had filed suit in the district court, seeking to prevent the city from erecting a municipally owned electric light and power plant and to prevent a federal loan for the purpose, has withdrawn all suits.

WOODRIVER, ILL.—P.W.A. has allotted the city a grant of $108,000 to help finance the proposed municipal light and power plant and distribution system which has been estimated to cost $375,000. Recently the city voted $375,000 in bonds for the project, but the full amount of the authorization will not be issued since the P.W.A. grant was allotted.

DEWITT, IOWA—At a special election held recently citizens voted overwhelmingly to renew private service. There were 612 votes cast. Of these the Iowa Electric Company was given 428 for a 20-year franchise and 175 voted against the proposition.

SUMNER, IOWA—Complete official returns of the special election held on September 24 on a proposal that the city grant the Central States Power & Light Corporation a ten-year franchise to furnish electricity in the city show that the proposition was defeated 580 to 331. On September 21 the recently completed municipal light and power plant went into service.

GLASCO, KAN.—Efforts of the city to establish a municipal light and power plant failed completely when a recent decision of the state Supreme Court sustained a district court injunction obtained by the Kansas Power Company to restrain the city from purchase of generating equipment. The state Supreme Court upheld the district tribunal's decision that city officials of Glasco had not taken proper legal procedure to establish a city-owned plant.

PHILLIPSBURG, KAN.—By a vote of more than four to one, citizens recently approved an issue of $95,000 in revenue bonds for construction of a municipal light and power plant. By voting the bonds the city may now accept the $120,450 loan and grant made through the P.W.A. on August 9. Phillipsburg is now served by the Kansas Power Company without a franchise.

ABERDEEN, MISS.—City will vote November 12 on a $119,000 bond issue to finance construction of an electric distribution system to connect with the T.V.A. transmission lines.

MACON, MO.—Preliminary details for construction of an electric power plant are being worked out by the Board of Public Works following approval by the President of a federal grant of $36,000. The city will put up $80,000 for the improvements out of the earnings of the plant. There will be no bond issue or increase in taxation, for the project costing $116,000.

MCCOOK, NEB.—A temporary truce is in force between the city council and the Nebraska Light & Power Company in the controversy over rates. The present contract between the city and the company to furnish light expired October 1 and it was agreed to continue the contract to not later than March 1, 1936. At a hearing before State Engineer Tilley the city was given authority to organize a municipally owned power plant and plans were reported under way for the district to buy the private company's plant for which the latter was said to be asking $650,000. At the time the contract expired the company was building a new plant as a result of flood damage and the company argued that for this reason it would be difficult for them to furnish the city with an accurate production price.

CHATTANOOGA, TENN.—Application made by the Municipal Electric Power Board for a $6,000,000 P.W.A. loan-grant to construct a city-owned electric system has failed to get P.W.A. approval. Kenneth Markwell, state P.W.A. director, was quoted by Colonel H. C. Fiske, chairman of the board as saying that the P.W.A. funds allocated to Tennessee had been assigned before the Chattanooga application was taken under consideration.

ELECTRA, TEX.—Proposal to issue $75,000 municipal bonds to construct an electric light and power plant was adopted at the recent election by a vote of 238 to 36.

MIDLOTHIAN, TEX.—Petition has been filed in federal district court in Dallas by the Texas Power & Light Company asking for an injunction restraining the city from consummating a $90,000 grant and loan with the government for the construction of a municipal electric light and power plant. The plaintiff company contends that carrying out of the contract between the city and the federal agency would deprive it of its property without due process of law. It further challenges the constitutionality of the National Recovery Act.

MILWAUKEE, WIS.—Recommendation that the city reconsider its present policy of building a power plant to compete with the Milwaukee Electric Company and instead carry on negotiations for the purchase of the private utility's distribution system, has been made to the Common Council by its special committee on public utilities. The committee's plan does not involve purchase of the utility's power plant nor its street car system.

SEATTLE, WASH.—First steps in favor of the purchase by the city of the electrical and steam-heating systems of the Puget Sound Power & Light Company were taken when the City Council finance and utilities committees approved the request of Superintendent of Lighting J. D. Ross for authority to make a survey of the property. Formal request for an election on November 26 on the question of the city's purchase of the power holdings was submitted by J. D. Ross prior to his leaving for Washington, D. C., to resume duties on the Securities and Exchange Commission. In his letter Mr. Ross declared that it is his opinion that the time has come for the merger, to eliminate duplication and the cost of competition.

CAMDEN, N. J.—Public Service Electric & Gas Company was defeated last week in an attempt to halt a referendum on the erection of a municipal light plant at the November election. Permission to print the question on the ballots was granted by the state Supreme Court at Trenton. But the court also granted a petition of Public Service that it review a resolution by the Camden City Commission several weeks ago authorizing the referendum.

SALES OPPORTUNITIES IN NEW CONSTRUCTION

HINTON, W. VA.—United States Engineer Office, Huntington, W. Va., has surveys under way for new Bluestone reservoir and dam on New River, near Hinton, latter to be 150 ft. high, with crest line of 1,850 ft.; reservoir at full stage will be 35 miles long, project to include hydro-electric generating plant at later date, with transmission and distribution lines. Cost about $13,000,000 Initial appropriation of $1,000,000 available.

FLAGSTAFF, ARIZ.—Flagstaff Electric Light Company has concluded arrangements with Arizona Power Company, Prescott, Ariz., for new 400-kw. transmission line from hydro-electric generating station of latter utility on Fossil Creek to Flagstaff city limits, about 40 miles, for local power supply. Substation will be built by Flagstaff company. Cost about $75.000.

LOUISVILLE, KY.—Joseph E. Seagram & Sons, Inc., 405 Lexington Avenue, New York, plans installation of motors and controls, conveyors, loaders and other equipment at new multi-unit distilling plant on 40-acre tract of land at Louisville, recently acquired. A power house will be built. Cost about $1,500,000. Joseph & Joseph, Breslin Building, Louisville, are architects.

HOUSTON, ALA. — Houston-Henry-Dale-Geneva County Power Association, Houston, recently organized, plans new transmission and distributing lines in four counties noted, totaling about 32 miles, including power substation facilities. Service will be secured from Alabama Power Company, Birmingham, Ala. Cost about $110,000. Financing is being concluded through federal aid.

ROCHESTER, N. Y.—Eastman Kodak Company, Kodak Park, plans installation of motors and controls, regulators, conveyors, etc., in new multi-story plant addition. Cost about $350,000.

PORTLAND, IND.—Acme Electric Company, Inc., Portland, plans hydro-electric generating plant on Salamonie River, Huntington and Wabash Counties, with initial capacity of about 5,000 kw. Transmission and distributing lines will be built for service within area of station, with main transmission line about 9 miles long. Cost over $500,000. Application has been made for Federal permission and hearing is scheduled early in November.

GRAND FORKS, N. D.—Is arranging bond issue of $475,000 for new city-owned electric light and power plant, and electrical distribution system. Proposed to begin work soon. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

SEATTLE, WASH.—Todd Seattle Drydocks, Inc., Harbor Island, plans installation of heavy duty motors and controls, conveyors, electric hoists and other equipment in connection with new five-section 15,000-ton capacity drydock. Cost close to $500,000.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, Knoxville, receives bids until November 1 for electrical and mechanical equipment, drives and conveyor belting, etc., for handling of concrete and aggregates for central concrete mixing plant, storage and recovery system at Pickwick Landing Dam.

IMPERIAL, NEB.—Has plans for new city-owned electric light and power plant. Cost about $60,000. Fund is being secured through federal aid. Henningson Engineering Company. Union State Bank Building, Omaha, Neb.. is consulting engineer.

BUFFALO, N. Y.—Niagara, Lockport &

KUHLMAN
Rural Line
TRANSFORMERS

1 To remove cover in field, unscrew bushing cap.

2 Gap limiting lightning surge that might be impressed on winding.

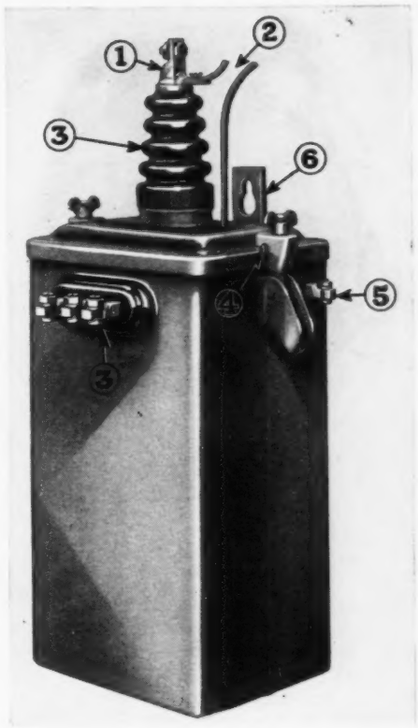
3 Removable stud type bushings.

4 Bead on cover engages groove of hinge-type hold down clamp.

5 Grounding stud for high voltage neutral.

6 Simple welded brackets for hanging from bolts passing through pole or crossarms.

Location of primary and secondary bushings and hanger brackets may be changed to meet individual customer requirements.



meet the need for
REDUCED FARM LINE COSTS

APPLICATION—Designed for use on three phase four-wire Y systems with grounded neutral. Single phase and connected on high voltage side between one high voltage phase wire and grounded neutral.

SIZES—Only 1 K-va. and 3 Kv-a. unless a demand is developed for larger units.

HIGH VOLTAGE—Designed for 2400-, 4800-, 7200- and 7620-volts to operate on Y voltages of 4160-, 8320-, 12470- and 13200-volts respectively.

LOW VOLTAGE is 120/240-volts (3-wire) with a connection inside the tank so that full capacity can be obtained at 120-volts. Four low voltage leads are brought out of the coil and connected by means of lugs to a gang three stud bushing. Transformers can also be furnished for 2-wire service only.

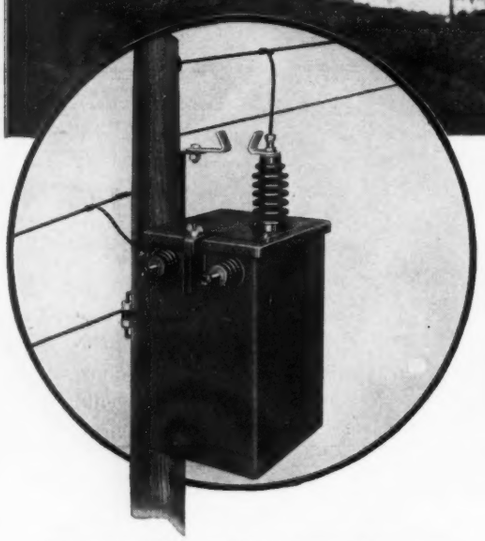
FUSE LINK in series with lead to primary bushing is optional to protect line against outage in event of transformer failure.

SELF-PROTECTING—Both primary and secondary bushings are provided with gaps.

Write for Bulletin 35-2 which explains the many advantages of Kuhlman Rural Line Transformers.

KUHLMAN ELECTRIC COMPANY
Transformer Specialists Since **1894** **Bay City, Michigan**

For Economical
RURAL DISTRIBUTION



Use
WAGNER
FARM-LINE
Transformers

Wagner Farm-Line transformers

(1) reduce the cost of rural line construction
(2) reduce installation costs
(3) reduce maintenance costs

Because:

1. Only one high-voltage bushing used on transformer; hence, only a single wire (hot wire) transmission line is necessary.

2. Mounting brackets are provided on tank for bolting transformer direct to pole — eliminates use of hanger irons and cross-arms for support.

3. Low-voltage bushings are brought out the side of tank — facilitates connecting of service lines.

4. Transformer equipped with co-ordinating protective gap — self-protecting against lightning.

5. Solderless connectors are used for all bushing terminals and grounding lugs — no solder required for connecting transformer to line.

6. Stud-type-bushings prevent syphoning of oil.

Wagner Farm-Line distribution transformers are available in 1- and 3-kva ratings, 60-cycle, 2400 to 7620 voltage classes for operation on three-phase, four-wire service with solidly grounded neutral. For larger ratings consult nearest branch office.

Write for Bulletin 172, Part 4G, which describes the construction features of these transformers.

T335-6

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.

TRANSFORMERS - • MOTORS - FANS - BRAKES

Ontario Power Company plans construction of new transmission and distributing lines in parts of ten counties in western New York, including Erie, Ontario, Wyoming and Allegany Counties, totaling about 1,615 miles in all, with power substation and service facilities for rural electrification in territory noted. Permission has been granted. Cost over $2,000,000.

SAVANNAH, GA.—Savannah Electric & Power Company plans extensions in transmission lines in Effingham and Chatham Counties, to serve a number of new communities, including Burroughs, Monteith and Rincon, about 27 miles, with electrical distribution systems for local service. Cost over $35,000.

PHILADELPHIA, PA.—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., receives bids until November 1 for one motor-generator set, complete with switchboard and accessories, for Philadelphia Navy Yard (Schedule 6301).

CHICAGO, ILL.—National Gypsum Company, 111 West Washington Street, plans installation of motors and controls, conveyors, etc., for expansion and improvements in mill of Universal Gypsum & Lime Company, recently acquired. Cost about $450,000.

FORT PIERCE, FLA.—Plans extensions and improvements in city-owned electric light and power station, including installation of new 2,500-kw. turbo-generator unit and accessory equipment. Cost about $210,000. Financing has been arranged through federal aid.

LOS ANGELES, CALIF.—Los Angeles Water and Power Bureau, 207 South Broadway, D. P. Nicklin, purchasing agent, receives bids until October 29 for quantity of electric meters as follows: 48 5-amp., 115/230-volt; 300 10-amp., 115/230-volt; 200 25-amp., 115/230-volt; 36 5-, 10-, 25- and 50-amp., respectively, all 230-volt; all meters three-wire, single phase type (Specification 1799).

PORTSMOUTH, N. H.—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., receives bids until November 5 for 40,000 incandescent lamp sockets for Portsmouth Navy Yard (Schedule 6273).

DETROIT, MICH.—Evans Products Company, Union Guardian Building, plans installation of motors and controls, conveyors, etc., in new addition to automobile loading device and equipment manufacturing plant. Cost about $100,000.

GLENWOOD, MINN.—Has secured fund of $150,000 through federal aid for new city-owned electric light and power plant, and distributing system. Proposed to begin work soon. Burlingame & Hitchcock, Sexton Building, Minneapolis, Minn., are consulting engineers.

DUNKIRK, N. Y.—American Fork & Hoe Company, Cleveland, Ohio, plans installation of heavy duty motors and controls, conveyors, electric hoists and other equipment in proposed new roll mill at works at Dunkirk. Cost close to $100,000.

SALUDA, S. C.—Broad River Power Company, Columbia, S. C., plans extensions in transmission lines from Saluda to Chappelle, Newberry County, and vicinity, about 15 miles, for service at latter point. Application has been made for permission.

FAIRFIELD, CONN.—McKesson & Robbins, Inc., has approved plans for new multistory addition to drug and pharmaceutical manufacturing plant, all equipment to be electric-operated. Cost close to $100,000. Albert Kahn, Inc., New Center Building, Detroit, Mich., is architect and engineer.

AYNOR, S. C.—Carolina Power & Light Company, Raleigh, N. C., plans extensions in transmission lines from Mullins, S. C., to